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Fires in Mine Shafts

In summarizing the serious mine accidents that have occurred since the first of the year, the number of fires at metal mines attracts attention. There has been a greater number of fires at coal mines, but in the case of metal mines, the cause of most coal-mine fires, gas, is absent.

Not including the Porcupine conflagration, the two most serious fires at metal mines were that which broke out in the Belmont mine Feb. 23, and the recent fire in the Giroux shaft. Both of these fires were attended by loss of life in the shaft, and this fact emphasizes the need of greater protection against fire in the exits from a mine.

The large size of the timbers generally used in lining shafts, and, in most mines, the constant drip of water upon them, would seem to offer a certain resistance against fire, but experience has proved that the timber shaft-lining is rapidly dried and ignited, and, on account of the drafts, the fire is apt to spread more rapidly in the shaft than in any other part of the mine. Not alone is passage through the shaft hazardous at times of fire from the liability of burning of the shaft itself, but the danger from the gases from the fire is even greater.

Several recent fires, and the fire at the headframe of one of the mines of the Tennessee Copper Company, several years ago, demonstrated that fire is as apt to spread down the shaft from the surface as upward, especially if there are two or more shafts and a fire occurs at the collar of a downcast.

The protection of shafts against fire should not offer any insurmountable difficulty. Fireproof materials for shaft lining could be prescribed by law, but to limit shaft lining to concrete, masonry, or steel, would be too expensive for many small mine operators to bear. Furthermore, fireproof material in the shaft would not remove the danger from gases. It does seem, however, that considerable protection could be afforded from both fire and gas spreading to the shaft by building fireproof bulkheads and doors in all drifts leading into the stations. Placing such bulkheads in pairs in the manner of an airlock would be even better. The expense of bulkheads would not be so great as seriously to affect mining. The idea of fireproof bulkheads could well be extended to the shaft itself, mounting the doors on hinges in a manner similar to what used to be a common practice of lowering a wooden platform or shelf across the shaft to land a bucket at a station.

Protection from fire from the surface can be obtained by lining the collar with fireproof material. This would not, in most cases, be a prohibitive expense. But one of the surest protections from a shaft fire from such a source, would be to do away with the timber headframes and shaft houses. Headframes may be built of steel almost as cheaply as of timber; the difference in cost is at least well spent as insurance against fire spreading from the surface to the mine.

Tin Plate Scrap

As is well known, the utilization of bright tin scrap has been carried to a high degree of perfection. The cutters of large shapes usually sell their scrap to button, badge, or roofing-cap manufacturers, who in turn sell their clippings to the detinners, who treat them either by an electrolytic or a chemical process, recovering tin or tin chloride and a mild-steel scrap. This scrap, when cabbaged, is eagerly sought by the iron and steel men, whereas the tin scrap can be melted only for heavy castings on which no especial strain is to be placed.

The treatment of the bright scrap is marked by no special difficulties, as it packs well, as a rule, and has no foreign matter to contaminate either the treating solutions or the product. However, the treatment of old tin cans has not made advances corresponding to those in the recovery of tin from bright scrap, the tonnage treated of the latter being for the world probably in excess of 175,000 tons

yearly. Except for the goat, the old tin can has but few friends. Although they are used to some extent in mining camps as a precipitant for cupriferous mine and concentrator waters, and have, in some cases, been used as a ferruginous flux in cases of shortage of iron-bearing fluxes, the ordinary mining camp is marked by an encircling ring of old tin plate. Even in the cases cited above, where the old tin can is used, the tin is not recovered, as the copper refiners have not yet found enough of the metal in their slimes to make it a recoverable byproduct.

Around the city the tin can is scarcely less of a landmark, though seen only by the traveler in or out, thanks to garbage removal. There have been many efforts made to solve the problem of tin-can recovery, including electrolytic tin plants, using alkaline-hydroxide baths; deheading and desoldering devices, with attempted use of the recovered plate either for roofing caps or, after removal of the tin, for lye cans; chemical recovery by hydrochloric-acid baths; and detinning by a centrifugal machine after heating. These processes have all proved failures, from two great underlying causes: the great bulk of the article for a given weight prohibiting long-distance shipments to any large central plant, or economical treatment when there; and the dirt accompanying the can, consisting of ashes and garbage. This dirt is expensive to remove, while, if left in, the electrolytic slime or chemical solution is an untreatable mush.

Previous crushing and rending of the cans to insure cheaper carriage and treatment, seem questionable, as it appears that even with the present price of tin, a portion of the iron must be marketable as black plate, to cover washing charges. These conditions may not be true in Europe, as it is stated that the Goldschmidt works in Germany is treating old cans, although it is difficult from the information given to know whether these are clean, imperfect cans, or what are known in this country as swill cans.

There seems no question but that with the various civilized governments specifying higher percentages of tin on the plate used for cans, and a decreasing tin supply, the old tin-can question is of some importance, but up to date the two chief metallurgical uses, the recovery of old can solder by heating the cans, a process often carried on by the ubiquitous Chinaman, or the melting into sash weights, take no account and make no recovery of the tin.

The Consulting Engineer

The consolidation of mining interests that has taken place during the last 10 years, the enlargement of the scale of operation, and the activity of great mining houses and syndicates with their own corps of engineers have undoubtedly reduced the field of the consulting mining and metallurgical engineer in general practice. There is, nevertheless, a large amount of mining by individuals and small companies still going on, and among them the consulting engineer ought to find a much wider field of usefulness than is the common experience. That he does not is not his fault, but is rather due to the ignorance and inexperience of the small operator, who is apt to enter the mining business with the idea that no special knowledge is required, entirely shutting his eyes to the fact that a prime reason for the general success of the large mining houses and the frequent failure of the small operator hinges largely upon this very point. This is illustrated by the following experience:

A group of Eastern business men owning a successful gold mine decided that they could further add to their profits by treating their low-grade ore in a mill of their own. One of their number volunteered, for a consideration, to build the mill. This man had had no experience or training in milling but was extremely optimistic. He flitted here and there, visiting mills and collecting ideas. Thus equipped he started in to furnish his mill. New machinery was too expensive, so he picked up bargains in crushers, etc., that looked as good as new. He also found that modern methods were too slow and tedious and devised short cuts to get the gold out quickly. He rather liked the Pachuca-tank idea but decided that a galvanized-iron air-lift pipe would do. He was not convinced that his judgment was at fault until he saw the pipe collapse at the first trial. When he was finally stopped in his mad career by lack of funds, the best he could show for the thousands he had spent was a building filled with junk and an apology for a milling process.

This probably is an exaggerated case, but it illustrates the tendency on the part of some otherwise keen business men to underrate the importance of a consulting engineer for a proposed milling undertaking, on the ground that such a person is a useless luxury. The consulting engineer, as a professional man, is, of course, prevented from advertising himself in any very direct way; he is bound to wait, in a receptive position, for clients to come to him. The great trouble is that many persons who ought to become clients of some good engineer do not know their own necessity. We are constantly in receipt of letters inquiring for information of a certain character, to which we reply that "the subject of this inquiry is one upon which, in our opinion, professional advice ought to be sought." We often wonder to what extent our own advice in this particular is taken.

There are two kinds of workmen. One works only to get in his time; the other works to do a good job and has joy in doing it. One drops his hammer at the first pull on the whistle cord; the other finishes driving the nail, and more, if necessary. One works to do somebody; the other to do something. The second kind of workman does not have to strike for increase in pay. That matter takes care of itself, and the man is apt to become a foreman and otherwise rise in the world. The other kind is fired when business is slack and then loafs around with a grievance.

The price for ordinary spelter at London last week touched 6.05c. per lb. The cost of freight from Kansas smelting points, together with commissions and insurance, comes to about 0.41c. Consequently, the Kansas smelter selling at Liverpool would net about 5.64c., f.o.b. works. The freight rate from Kansas smelteries to St. Louis is 13c. per 100 lb. Thus, the St. Louis and London prices of spelter have lately been about at parity, with a little in favor of St. Louis.

The price of platinum has continued to advance and at present quotations an ounce of the refined metal is worth 2¼ ounces of gold. Moreover, the tendency is still upward and further advances are expected. Advices from Russia indicate that the present season will see a decrease rather than an increase in the output from the older placers of the Urals.

Metallics

A jet of compressed air directed against the heated ends of work that is being forged will revive the heat and also blow off all dirt and scale.

The rough blocks of mica, as obtained from the mines, generally yield only a small percentage of trimmed sheet mica, 10 per cent. being a high yield; the rest of the product is suitable only for grinding.

Black waterproof dressing may be made by mixing together 7 lb. best black paint, ½ lb. powdered litharge, 1 pint oak varnish, ½ pt. boiled linseed oil and ½ pint thick boiled oil. Apply as ordinary paint. It is especially good for railway and wagon coverings, tarpaulins and such articles.

A conical hole may be made with an expansive auger by leaving the cutter a trifle loose and beginning the boring at the side where the smallest end of the hole is to be. The inner edge of the cutter lip being angular, the cutter will gradually draw itself out from the body of the bit, making the hole larger as the bit goes into the wood.

Sandstone obviously was once sand that was first eroded and then deposited and either subjected to great pressure by overlying masses perhaps thousands of feet thick, or cemented together by chemical solutions. Where formed by simple pressure it contains a large proportion of open spaces and thus becomes an ideal water bearer. Some sandstones will carry as much as six quarts of water per cubic foot. In other varieties the interstices may have been filled with cementing material, so that the rock may be for all practical purposes almost as dense as granite.

The hard coating of lead sulphate that forms on the plates of a storage battery can be removed, according to P. F. Trout in the *Electrical Review and Western Electrician* by allowing them to stand in fresh distilled water until a coat of lead hydroxide forms. They are then placed in a bath of dilute sulphuric acid, where a firmly adherent coat of lead sulphate forms in a short time. The acid is washed off with water and the plates placed in a bath of 3 parts water, 1 part ammonium hydroxide, and 1 part ammonium acetate, by weight. After the plates become clean they are washed with water and placed in sulphuric acid of 1.1 density. After an hour's immersion the plates are removed and dried. The ammonium acetate bath will retain its strength even after prolonged use, and when it does become weak can be strengthened by adding more ammonium hydroxide. About four days are required to remove a coat of lead sulphate completely.

By the Way

Members of a well known electrical association are reported to have said recently that the electrical jobbing trade is confronted with the problem of too many inventions; that inventors are bringing out new appliances so rapidly that supposedly uptodate machinery depreciates too quickly in intrinsic worth, resulting in great loss. A convocation should be called to induce electrical inventors to throw in the low speed until industry catches up with invention.

The report to the court of the receiver of a Western mining company discloses the fact that the sales manager, upon whom devolved the duty of floating the stock, received what is believed to be a record commission for that class of work. For every dollar received from the sale of the stock, said sales manager received 65c.—and not the least extraordinary thing is the fact that the receiver has been unable to discover what became of the remaining 35c. It seems to have been: Heads I win, tails you lose.

His last thought that of duty and safety of his fellow workers, Albert Shangard, a hoisting engineer for the W. E. Dodson Company at Morea, Penn., died at his post on Aug. 26 and saved a dozen lives. It was Shangard's work to operate a hoisting engine from the deep shaft of the colliery and to start and stop the cage on signal and to stop the cage when it reached the top. Just as the cage was within 10 ft. of the top of the shaft it was stopped in its ascent for no reason known to the miners. An investigation was made. At the operating lever was found Shangard, dead of heart disease. He lay as if asleep. Shangard evidently felt the fatal sickness coming on and knowing his duty he performed it almost with his last breath.

Important as are the losses in the initial purchase of coal, they are small compared with those which attend its burning. Many a mill owner looks out of the window and sees, without knowing, his dividends go up the chimney. Under well regulated conditions of combustion the flue gases should contain not less than 12 per cent. of carbonic acid gas. They frequently contain no more than 3 per cent. This means that for every ton of coal burned under the latter conditions more than 52 tons of excess air are heated to the high temperature of the flue gases. Chemistry meets these conditions by analyzing the flue gases and regulating the draft as indicated by the percentage of carbonic acid found. At $2.25 per ton, which is much below the average price, the fuel bill of the United States was over $1,000,000,000 in 1910. Of that amount chemistry could easily have saved $100,000,000, says Arthur D. Little in discussing the earning power of chemistry.

What with the Moroccan mine privileges under diplomatic discussion and the iron mines of the United States Steel Corporation being experted by Chairman Stanley of the Congressional Investigating Committee, mining has been getting front-page attention from the metropolitan dailies during the last week. According to the despatches, "the real difficulty in the way of an early settlement of the Moroccan war scare, it is believed at the French Foreign Office, lies in the special commercial and mining guarantees which Germany seeks in Morocco." Any excuse will do when one wants a naval base, or perhaps the dearth of news during "dog days" is responsible. Probably the latter is the case, this view being confirmed by the following Duluth despatch of Sept. 1: "Representative A. O. Stanley, chairman of the Congressional Steel Investigating Committee, planned a trip today to the Mesabi and Vermilion ranges, where he would inspect the mines controlled by the United States Steel Corporation."

An engineer in the Lake Superior country sends in a clipping regarding a wonderful mining property that is described by a local journal entitled *Opportunities*, a paper issued ostensibly in the interest of investors. The meat packers, who are reported to be utilizing every portion of the pig except the squeal, are going to be surpassed by the promoters of this versatile mining property, which is to produce from its successive strata, beginning at the bottom: Iron, gold, sand, brick and pottery clay, peat and town lots. "As you see," writes our correspondent, "this adds another to the several sources of wealth of northern Minnesota and, concretely, to the stockholders of the North American Iron Company. As I now figure it, taking the various statements of the North American management as my authority, this company has assets as follows: First, a deposit of peat from 3 to 9 ft. thick, covering 120 acres; next, brick clay, 48 ft. thick, covering 120 acres; next, sand, for which the inventive owners have not yet found a sufficiently profitable use; next, a deposit of quartz porphyry, 1500x 600x2800 ft., averaging $20 in gold and $7 in silver; next, an iron mine. The owners propose to develop the bottom first, leaving the gold for the future, which is well, for such an addition to the world's gold supply would tend to unsettle monetary equilibrium. But whether they are safe in calling the iron ore the bottom I do not know, and rather expect them to announce still other valuable deposits below it. But they are now developing the top layer, which is town lots, and the third layer, which is brick clay! Perhaps you did not realize how rich we are up here in nature's resources?"

Correspondence and Discussion

The Cost of Mining in Nicaragua

In an article in the JOURNAL of Sept. 2, Henry B. Kaeding gives some interesting figures, proving that the costs of mining and milling at the mines of eastern Nicaragua compare well with many districts more favorably situated in the United States. If the cost sheets of some of the other mines in the vicinity of the Siempre Viva should be published they would show that is not the only mine where low costs are attained, and always in spite of the difficulties and expense attending transportation of supplies.

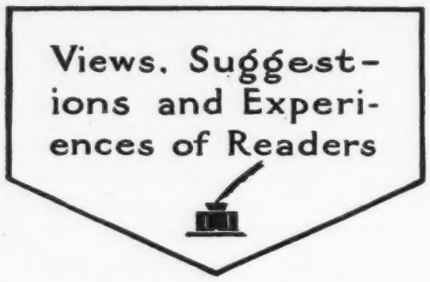
This question of transportation has been a cause of inquiry from men intending to investigate the mines of the Pis-Pis district. It has always seemed to appeal to them as an obstacle to profitably exploiting the gold-ore deposits of that region. The following remarks will indicate where those difficulties lie and how they may, in part, be overcome.

The shipping point for all supplies is New Orleans. The fruit steamers plying between that port and Bluefields stop at Cape Gracias à Dios, where there is no harbor. Supplies for the Pis-Pis mines are lightered ashore, carried up the Wanks river by steamer, then transferred to pit-pans or dugout canoes, which carry the freight from Wasspuc mouth up the Wasspuc, a tributary to the Wanks, and Pis-Pis rivers to within a distance of six or eight miles of the mines. Sometimes pit-pans are used all the way from the cape. The journey is made in about two weeks for heavy freight boats, which time may be greatly prolonged by floods in the rainy season.

Freight is unloaded at the dock in the land-locked lagoon of the Escondido river, at Bluefields, thence transferred to gasolene schooners of 35 to 75 tons burden, which run up the coast 90 miles to Prinzapolka, at the mouth of the river of that name. Pit-pans are then used to carry the freight up the Prinzapolka and its tributaries, the Banbana and Oconguas.

At the town of Tunky, the Banbana river is joined by Tunky creek. Both streams may be used, but most of the freight for the Pis-Pis district is taken up Tunky creek to a point where canoe navigation is no longer possible. The heads of canoe navigation of Tunky creek, the Banbana and Pis-Pis rivers are within a few miles of each other in the Pis-Pis district.

All these rivers are quite shallow in the dry season. Their beds are crossed by abrupt drops in the bedrock, causing cataracts or falls, over which the pit-pans have to be dragged by ropes.



The largest pit-pans carry about 14 tons, draw 18 to 24 inches of water and are manned by a crew of 17 or 18 Mosquito Indians. These large canoes cannot go the last stage of the journey to the Pis-Pis mines; the freight must be transferred to smaller canoes.

The difficulties of transportation begin at the end of the canoe trip. There are no facilities, such as derricks, for expediting the unloading of the canoes. Heavy, large machinery must be moved to the mines on skids; bulls are used to pack lighter freight. The roads are made by cutting the timber to leave a narrow path through the forest. They invariably are cut directly over the tops of the hills, when by going around the base time and trouble would be saved, although the road would be longer. The bulls follow one another, each one placing his hoofs in the same place as the leader; the result is that the roads become a series of mud holes separated by a high slippery ridge.

To reduce the expense of transportation the several mines should coöperate to do their own river traffic in a systematic way. Merchants are now doing that work at a profit of nearly half the rate charged the mines. Many of the cataracts and falls could be eliminated by grading the river bed in dry season, gasolene power boats could then be used to tow a fleet of pit-pans fully two-thirds the way up the river in one-third the time. This would reduce the number of men necessary to paddle the canoes, in fact by using gasolene boats but a few men would be needed to man a fleet of pit-pans as far as the power boats could go, then the full crew for each boat could complete the journey.

To improve the roads from the rivers to the mines, the "vertical curves" should be eliminated by going around the hills. The road-building plan of the *Conquistadores*, cutting the trees and brush for a width of 200 or 300 ft. to allow the sun to shine upon the ground, would be a wise one to follow. The surface of the road should not be level, but crowned or slightly sloped, so the water will drain and not accumulate in pools. On such a wide road the oxen will always find a fairly dry path.

Every native Nicaraguan is compelled to pay a road tax, usually collected by the local officials from the mining company, which in turn deducts the amount of impost from each man's pay. In lieu of road tax, an equivalent amount of work on the roads is acceptable, a fact which the mines might together take advantage of to their mutual benefit.

It is entirely feasible to build a tramway to connect the several mines with the heads of navigation of the rivers. Probably 16 miles of track would suffice, but such a line would cost too much for any one mine to build. At some time in the future all the Pis-Pis mines may be operated upon a much larger scale under one management, and the transportation problem solved.

COGNOS.

New York, Sept. 4, 1911.

Preservation of Mine Timber

Occasionally, articles have appeared in the JOURNAL on methods of treating mine timber and general timber preservation. Most of the processes now advocated consist in impregnating wood with creosote, solution of zinc chloride or other salts, all of which methods possess merit, but are rather expensive.

An interesting experiment in the preservation of railroad ties has just been conducted by the Southern Pacific engineering corps. Three years ago, 10,000 ties were placed in the Great Salt lake, along the line of the Ogden-Lucin cutoff. These ties are now being used, and the only drawback is that when so heavily impregnated with salt, they act as a "ground" to the electric current in the block-signal service.

On the old Promontory line of the Central Pacific ties that were laid 40 years ago have not decayed, proving the preservation properties of the salt in the formation in which the ties were placed. The piling in the long trestle across Great Salt lake is in an excellent condition, due to its immersion in salt water.

The experiments made by the Southern Pacific may result in the beginning of a wood-preserving industry along the shore of the lake.

H. B. W.

Salt Lake City, Aug. 30, 1911.

New Maryland Cement Plant

In the JOURNAL of Aug. 26, p. 390, a condensed statement of the equipment of the Tidewater Portland Cement Company is given.

In this plant, No. 8 Krupp ball mills are used for preliminary grinding ahead of the Fuller-Lehigh mills. This fact was not stated in the article.

THOMAS PROSSER & SON.

New York, Aug. 31, 1911.

Alfred J. Bettles

Alfred J. Bettles, of Salt Lake City, died Aug. 3, of peritonitis and euremic poisoning resulting from an operation for tumorous abscess. Mr. Bettles was for many years actively engaged in mining, milling and business throughout the West. The last 14 years of his life were spent in Utah, with Salt Lake as his headquarters, where he was widely known and greatly esteemed and respected. He was born in England, and moved to Ontario, Canada, as a young man. From there he went to Colorado, where he became interested in mining and milling. Later he went to Montana, where he made a reputation as a mine operator, millman and metallurgist. While in Montana, Mr. Bettles was with the Granite Mountain Mining Company, at Phillipsburg, in charge of the milling operations on silver ores. He built that company's Combination mill, at which plate amalgamation followed by concentration of the sulphides and treatment of the tailings by pan amalgamation was used. Mr. Bettles improved a great deal on the milling operations, and under his direction the property had its most sucessful period.

From Montana, Mr. Bettles moved his family to Salt Lake, and became connected with the Highland Boy mine (Utah Consolidated), at Bingham. While at the Highland Boy he made mill experiments on the porphyry ores of the Boston Consolidated, using the old Markham mill, with some alterations, and possibly was the first man to conduct experiments on this class of ore. Mr. Bettles was for several years with the Newhouse interests, and had charge of their mill work, designing and building the Cactus mill at Newhouse and the Boston Consolidated mill, at Garfield. A few years before his death, Mr. Bettles resigned from the Newhouse staff, and engaged in consulting work and in the direction of his private affairs. Recently he went to Alaska and examined property in the capacity of consulting milling engineer, to determine the advisability of erecting a plant. The mill was not built. At the time of his death, he had charge of the mill work of the Wilbert Mining Company, and was designing and building a silver-lead concentrator at its property on Little Lost river, Blaine county, Idaho.

As a mill man and metallurgist, Mr. Bettles stood in the front rank in his profession. He was a member of the Mining and Metallurgical Society of America, the Alta and Commercial clubs of Salt Lake City, and was a Mason of high standing. At the time of his death he was president of the United Grocery Company, of the Corocol Mining Company in Mexico, and other mining companies. In addition to this, he was interested in a number of enterprises, including the assay office and metallurgical works of Bettles & Bardwell.

Mr. Bettles' untimely death occurred at the age of 55. He is survived by a wife and four children. He was greatly beloved by all who knew him for his genial and kindly disposition, for his generosity and upright character. His loss is keenly felt.

An All American Fertilizer

The field force of the U. S. Geological Survey is searching for deposits of minerals which shall furnish the three necessary elements that are contained in a complete fertilizer, namely, phosphate rock, nitrate salts, and potash salts. The Survey has already discovered and surveyed enormous deposits of phosphate rock, and 2,398,590 acres of phosphate land, withdrawn at the recommendation of the Geological Survey, are now waiting legislation by Congress to enable their development.

In order, however, to insure an all-American fertilizer, regardless of importations from other countries, it remains to discover deposits of nitrate of soda and potash salts; as both of these minerals are readily soluble and are not found as outcrops, this is not easy. Nevertheless, it is believed that the geologic conditions prevailing throughout a large portion of the arid West favored the accumulation, during the earlier periods, of both of these salts, and hardly anything could be suggested which would be of greater assistance to the American farmer than the discovery of commercial deposits of either of these necessary fertilizing minerals.

The investigation into possible sources of potash salts in the United States is being made this year by the U. S. Geological Survey under an appropriation by Congress of $20,000 for the current year. One of the possible sources from which potash may be derived is in association with saline deposits left by the drying up of large bodies of salty waters, such as are known to have existed at one time in many of the now desert areas of southwest Oregon, Nevada, southeast California, Utah, and elsewhere. It is hoped that by testing these saline deposits some may be found sufficiently rich in potash to have a commercial value, and that there may even be located some large and important deposits.

As a part of this work, the Survey will soon fit up a temporary laboratory at Fallon, Nev., for the purpose of testing samples of salines from the Great Basin or desert areas. Samples of such alkaline salts will be tested at this laboratory free of charge if a definite statement of the locality from which they were obtained be sent with the samples. The location should be given by section, township, and range, if possible, otherwise by distance and direction from the nearest post office or settlement. Samples should be addressed to Hoyt S. Gale, U. S. Geological Survey, Fallon, Nev. Upon receipt of a request small sample sacks for sending material by mail will be forwarded from the above address. If so requested at the time that a sample is submitted for test, the accompanying information concerning the locality of the deposit will be treated as confidential; and the evidence thus obtained is not to be used for the purpose of making land withdrawals.

August Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during August, 1911, by a number of mining and industrial companies in the United States, Canada and Mexico.

The dividends shown in the table for August, 1911, amount to $9,811,912, as

United States Mining Companies	Situation	Per Share	Total
Alaska Treadwell, g.	Alas.	$0.50	$100,000
Bunker Hill & Sul., l.s.	Ida.	0.20	65,400
Hecla, l.s.	Ida.	0.02	20,000
Homestake, g.	S.D.	0.50	109,200
Klar-Piquette	Wis.	0.25	5,000
Manhattan Big Four, g.	Nev.	0.02	15,240
Mexican, s.	Nev.	0.10	20,160
Parrot, c.	Mont.	0.15	34,477
Tuolumne, c.	Mont.	0.15	120,000
Coal, Iron, Industrial and Holding Companies	**Situation**	**Per Share**	**Total**
Amal. Copper, c.	Mont.	$0.50	$769,439
Cambria Steel	Penn.	0.62½	562,650
Inter. Nickel, pfd.	U.S.	1.50	133,68[illegible]
Jeff. & Clf. C. & I., pfd.	Penn.	2.50	37,50[illegible]
Lehigh Coal & Nav.	U.S.	1.00	482,95[illegible]
National Carbon.	U.S.	1.25	78,750
U. S. Steel, pfd.	U.S.	1.75	6,304,919
Vir.-Carolina Chem. Co.	U.S.	0.75	209,943
Canadian, Mexican and Central American Companies	**Situation**	**Per Share**	**Total**
Beaver Con., s.	Ont.	$0.03	$59,989
Buffalo Mines, s.	Ont.	0.03	30,000
Coniagas, s.	Ont.	0.45	360,000
Dominion Coal, c.	N.S.	3.50	175,000
Le Roi No. 2, g.	B.C.	0.48	57,600
San Toy, l.s.g.	Mex.	0.01	60,000

against $9,187,390 for August, 1910, while the dividends by mining companies and allied industries as reported to the Journal amount to $122,717,603 for the first eight months of this year as against $108,036,476 for the same period of last year.

Chronology of Mining for August, 1911

Aug. 1—Explosion in mine of Standard Pocahontas Coal Company at Shannon, West Va., killed three men.

Aug. 4—Suit filed by Government at Columbus, Ohio, against six railroad companies and three coal-mining companies, charging combination in restraint of trade.

Aug. 10—A four-deck cage dropped in the Krupp-Hannibal mine near Bocum, Germany, killing 25 men.

Aug. 14—Announcement of purchase by the American Smelting and Refining Company of the Tiro General mines at Los Charcos, San Luis Potosi, Mex., and

of the Central Potosi railroad, for $800,000 gold.

Aug. 15—Granby smeltery in Boundary district, British Columbia, closed for lack of fuel due to strike.

Aug. 17—Sale of National Mining Exploration Company to Iron Cap Copper Company confirmed by U. S. district court in Boston.—Collapse of strike at Carey and Deering, Kansas.

Aug. 19—Cave-in at the openpit of the Buffalo & Susquehanna mine on Mesabi range, buried 12 men and caused several fatalities.

Aug. 22—Contract executed for sale of Ray Consolidated smeltery to American Smelting and Refining Company.

Aug. 23—Explosion and fire at new shaft of Giroux Consolidated company resulted in seven deaths and damage to shaft.

Aug. 30—Confirmation of sale of Cleveland mine in Idaho to Federal Mining and Smelting Company.—Case of Fred J. Bliss against Anaconda Copper Company, based on smeltery fume troubles reached United States Supreme Court.

Phosphate Production in 1910

The mining of phosphate rock for fertilizer showed increased activity in 1910, with the greatest production in the history of the industry. The output, according to F. B. Van Horn, of the U. S. Geological Survey, was 2,654,988 long tons, against 2,330,152 tons in 1909, an increase of 324,836 tons. Prices, however, were lower, the value of the 1910 output being $10,917,000, or $4.11 per ton, against $10,772,120, or $4.62 per ton for 1909. Thus while the tonnage in 1910 increased 13.9 per cent., the value of the year's output increased less than 2 per cent. Nearly half of the phosphate rock produced in 1910 was exported, the shipments being 1,083,037 long tons. In 1909 the exports were 1,020,556 long tons.

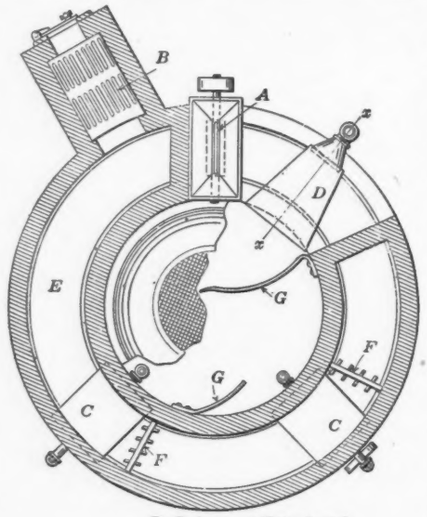
There are at present five producing phosphate fields in the United States. In the order of quantity of production they are (1) Florida, (2) Tennessee, (3) South Carolina, (4) Arkansas, (5) Idaho, Wyoming and Utah. By far the largest of these fields is the Idaho-Wyoming-Utah field, where large deposits of high-grade phosphate rock, recently discovered, are available for mining. The field next in available unmined rock is probably Tennessee, where large areas are underlain by deposits of high-grade rock. Florida has a large reserve tonnage, but at the present rapid rate of mining it will not be many years before the rock will be exhausted.

South Carolina has been mining phosphate rock since 1868, and the production has steadily declined since 1889, with the exception of two or three years, when a slight increase in production was noted. Arkansas has never been much of a factor, and, so far as known, the deposits of this State are not of great extent.

The discovery of a bed of phosphate near Melrose, Mont., similar to the Idaho deposits, is reported. Prospecting is not sufficiently advanced to reveal the extent and thickness of this deposit.

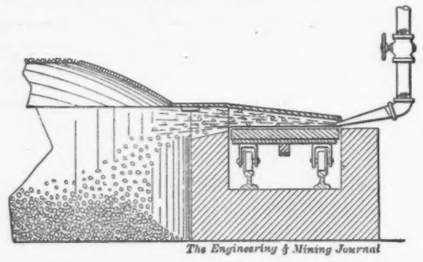
Wilfley Magnetic Roasting Process

One of the recent patents of Arthur R. Wilfley (U. S. pat. No. 996,548) covers a furnace for giving ores a magnetic roast. The feature of the process is the



WILFLEY MAGNETIC ROASTER

use of a steam jet to completely remove the roasted ore particles, the moisture tending to prevent over-roasting of the ore for purposes of magnetic separation. Cooling jackets also aid in securing a magnetic roast.



SECTION ON X-X, SHOWING DISCHARGING DEVICE OF WILFLEY ROASTER

In carrying on the roast, the ore goes through the hopper *A*, on to the revolving hearth *E*, which transports it under the cooling jackets *C* to *D*, where the roasted ore is discharged into the central chamber by a steam blast. The deflectors *G* effect an even distribution in the central compartment, which is covered with a screen to prevent the escape of ore particles and to allow the uncondensed vapor and air to pass out. Heat is supplied to the roasting chamber by the furnace *B*, and the ore stirred by means of stationary rabbles *F*.

Transvaal Mineral Output

SPECIAL CORRESPONDENCE

According to figures published by the Government Mines Department, the mineral output of the Transvaal for the year ended June 30, 1911, was as follows: Gold, 7,848,872 oz.; diamonds, 1,795,007 carats; coal, 4,118,869 tons; silver, 859,526 oz.; other minerals to the value of £611,753; total value, £36,319,387.

For the year ended June 30, 1910, the output of gold was 7,308,551 oz., the increase during the last 12 months being thus 540,321 oz., valued at £2,295,138. For diamond mining in the Transvaal the last year was unsatisfactory on the whole, although in the latter half there was an improvement. Still for the year ended June 30, there was a fall in the production of no less than 303,520 carats, and in value £50,487, although during the last 12 months the average price per carat was 14s. 1d., as against 12s. 6d. per carat for the year ended June 30, 1910.

The most remarkable feature in connection with the coal trade of the Transvaal is the steady persistent growth in face of numerous drawbacks. For the year ended June 30, 1911, there was an increased output of 242,105 tons in the face of falling prices, and a threatened displacement of coal by the use of electrical power on the gold mines. As a matter of fact, although the average price of coal has materially declined at the collieries until best coal is reduced to an average price of 4s. 5d. per ton, the collieries are more prosperous than ever, and with few exceptions are paying dividends to the shareholders. So far it would seem that the use of electrical power is not calculated to reduce the consumption of coal originally anticipated, which seems destined to go on as formerly. Silver being a byproduct of the gold mines, naturally increases along with the output of gold, and calls for little comment.

It is, however, when the output of minerals and metals other than gold, silver, diamonds and coal is considered, that the most encouraging feature of the mineral output of the Transvaal is apparent. Gold, silver and coal seem destined to increase gradually for some time to come, but during the last six months the production of tin has increased from £150,358 to £248,810, and there are not wanting signs that if the Northern Transvaal tinfields hold out as anticipated, they may become the premier tin-producing fields of the world. Already the Zaaiplaats mine has passed the Dolcoath mine as a producer, while several other properties are being opened up with every prospect of success. Copper has increased from £29,627 to £36,867, and with the completion of the railway to the Messina district other mines will be opened. In other base mineral industries there is little room for comment.

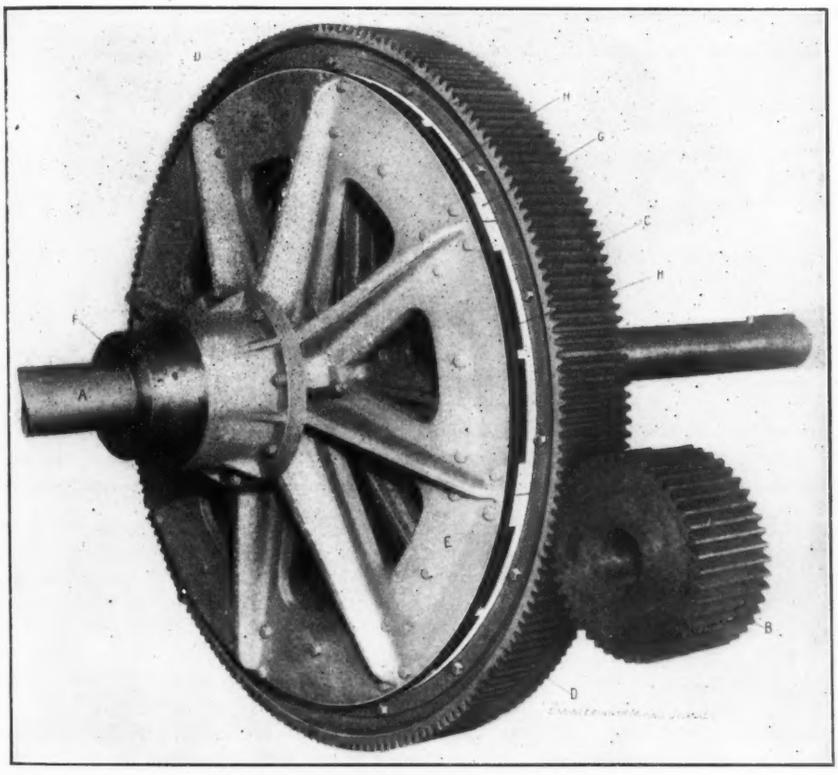
Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent to telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

A Slipping Friction Drive for Dredges

In the pages devoted to "Details of Practical Mining" in the JOURNAL of August 12, there was published an article describing a form of cone friction drive for mine hoists in which it was stated that the use of cork insets in the wooden friction cone seemed to indicate that a yielding surface was an advantage. That this statement is open to exceptions, when the friction drive is used in certain forms of work, is proven by the applications of the Spencer Miller patented air-cooled slipping-friction, wherein a most efficient friction is obtained when two opposing surfaces are not only non-yielding, but highly polished.



THE SPENCER MILLER SLIPPING FRICTION

It is a recognized fact that the braking power of a locomotive is greatest just the instant before slipping of the locked wheels along the rails occurs. In other words the locomotive can be stopped in the shortest distance when the braking power is so applied that no slipping follows. When slipping begins in a friction gear the efficiency of the friction rapidly diminishes, so in the older forms of friction gears, slipping once begun is almost impossible to stop. When slipping does occur a great amount of heat is generated that would rapidly burn wooden faces to charcoal or destroy ordinary metal surfaces.

There are occasions when it is desirable to have a friction gear slip when a certain load is exceeded, but the problem of protecting the surfaces from the effects of heat for a long time remained unsolved. Mr. Miller's invention, herein described, seems to have satisfactorily solved this problem. His slipping drum has been adopted on winches for operating clam-shell buckets, and while originally designed for use in hoisting engines used for coaling vessels at sea where provision for slipping must be made, it has also found some applications in the field of mining.

One such application is in a friction drive for the buckets of gold dredges. In dredging there is always danger of the buckets catching in some projecting boulder or buried tree which does not yield and as a consequence the engine or the bucket chain breaks in some part. With this friction drive, when a certain load on the chain is exceeded, slipping occurs; the buckets come to rest while the motor continues running without damaging any of the intricate and massive machinery of the dredge.

This slipping-friction drive for dredges is shown in the accompanying illustration wherein *A* is the shaft carrying the upper tumblers, *B* the pinion and *C* the wheel of the driving gears, which last is not keyed to the shaft *A*, but turns upon it like a loose pulley. To the gear wheel *C* is bolted a hard steel disk *D*, the surface of which is highly polished. The head *E* is pressed by heavy adjustable springs *F*; *E* is fastened to the shaft by a feather so that it can exert against *D* the full pressure of the springs. The surface of *E* that bears against *D* is composed of a number of combination metal blocks *G* bolted to the face of the disk, for nearly its entire surface; *H* indicates open spaces to facilitate passage of air for keeping the blocks *G* cool. The tension on the springs can be so adjusted within limits that slipping occurs only when a predetermined load is exceeded. The slipping does not cause dangerous heating to the surfaces.

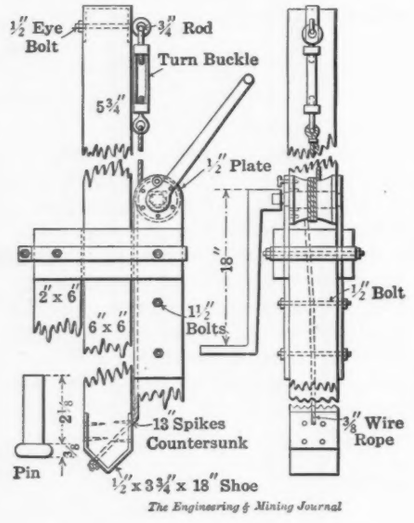
In this form of friction drive, when slipping does occur, the friction hold is re-established almost immediately that the pull falls below that to which the compression of the springs is adjusted. Oil or water on the disks momentarily lowers the efficiency of the friction or destroys it altogether, but the heat generated by the slipping destroys the oil or evaporates the water so that the disks regain their hold almost instantaneously. The hard-steel disk and combination metal blocks are readily removable, but it is a surprising fact that though some hoists equipped with this friction drive

have been in more or less continuous use for 10 years, the manufacturers have so far never supplied any such parts to replace the worn originals.

This friction is too expensive to apply to the usual types of friction mine hoists; their duties are not under conditions that require it. The friction is now used in the hoists of the Lidgerwood-Miller system of coaling vessels with clam-shell buckets; in all the Panama Canal cableway hoists; by the War Department; in the winches used for the loading apron of freight-car ferries about New York harbor, and it is possible that the device will be used as a clutch for driving milling machinery.

Hand Operated Spud for Drill Boat

In making borings under water for a lock location for the Ohio river improvement project, Davis calyx and Cyclone drills were used The drills were supported on large scows in the bottom of which a slot was cut, through which the drills operated. To anchor the scows, the hand-operated spud shown in the accompanying illustration from *Engineering and Contracting* was used.



DETAILS OF A DRILL-BOAT SPUD

As is shown by the cut, a wire rope, fastened near the lower end of the spud, passes upward around the barrel of the hand winch, thence to the turnbuckle, the end of which is fastened to the top of the spud. The slack in the rope can be taken up by the turnbuckle. Turning the winch handle in one direction lifts the spud; in the other direction, lowers it.

Vanadium cast iron is being used in locomotive cylinders, piston rings and other machinery parts, because of the small loss in casting and the increased length of service obtained.

Comparison of Diamond and Shot Drills

A recent report of the Department of Works and Mines of Nova Scotia offers an opportunity to compare the results attained by three diamond drills of various patterns, and one Calyx shot drill. These same drills have been at work for a number of years past, and the tendency appears to have been for the total cost of all the boring to decrease and for the cost per foot by diamond drill to increase, while the cost per foot for the Calyx drill has decreased. The character of the strata was approximately the same in all cases, consisting of sandstones, shales, and conglomerates, typical of the coal measures in that district. The costs of the several drill holes are tabulated below, in which statement drill No. 1 was a diamond drill operated by steam with coal fuel; drill No. 2 was likewise a diamond drill operated by steam power, with wood as fuel; drill No. 3 was a diamond drill of the hand-power type, but operated by a small steam engine; and drill No. 4 was a Calyx shot drill operated by steam power with coal and wood as fuel. Hole No. 2 was inclined at 45 deg.; the others were vertical.

COMPARISON OF HOLE BORING COSTS

	1 Diamond	2 Diamond	3 Diamond	4 Calyx Shot
		Angle of 45 Degrees		
Total depth of hole, feet	463	125	285	559
Size of core, inches	2	1⅛	1⅛	6
Fastest hourly rate, feet	5½	3.75	.....	6½
Average hourly rate, feet	1.93	1.00	0.92	1.27
COST PER FOOT FOR:				
Labor	$0.131	$0.306	$0.392	$0.326
Management	0.356	0.500	0.295	0.358
Fuel	0.056	0.032	0.026	0.311
Light, oil, waste, etc	0.007	0.006	0.010	0.024
Carbon wear	0.048	0.048	0.053	.....
Shot consumption	.....	.....	.....	0.019
Gravel consumption	.....	.....	.....	0.005
Lumber	0.054	.....	.....	0.081
Casing pipe	0.030	0.032	0.004	0.018
Freight and truckage	0.058	0.244	.....	0.279
Blank bits	0.003	0.004	.....	0.020
Core barrels and lifters	0.032	.....	.....	.....
Laying water pipe, etc	.....	.....	0.025	.....
Total cost per foot	$0.775	$1.172	$0.805	$1.441

In explanation of the higher apparent cost of boring by the shot machine, it should be noted that core was larger than that from the other drills and that the hole was deeper.

Jacket Water for Copper Blast Furnaces

According to Percy E. Barbour two blast furnaces, one 72x180 in., and one 56x180 in., smelted during one 24-hour period the following: Green ore, 6; roasted ore, 492; converter slag, 102; blast-furnace slag, 32; silicious flux, 75; matte, 24.25; total, 731.25 tons. Total coke used, 83.04 tons.

During this period the jacket water was carefully measured and averaged for the two furnaces together 565 gal. per min. The temperature of the water fed to the jackets was 74.5 deg. F., and the temperature of the jacket water in the discharge launder was 110 degrees.

Verdigris on Amalgamation Plates

The stains of verdigris that frequently appear on amalgamation plates consist of oxide and carbonate of copper. The copper in the amalgam is oxidized by air and water. The copper may have been amalgamated with the gold, its salts may have contaminated the mercury, the pulp may contain compounds of copper that oxidize, chemicals may have been used in dressing the plates, but ordinarily verdigris stains result from there being too thin a coating of amalgam on the plates.

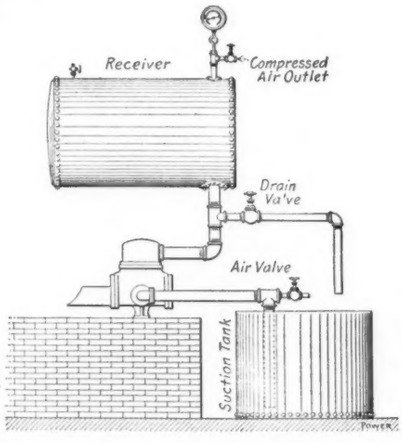
The stains are readily soluble in potassium cyanide and acid solutions, but as these chemicals also attack the metal of the plate, their use is always attended by reappearance of the stains. The best remedy is to leave more amalgam on the plates at cleanup time until a thicker coat has accumulated. To build the coat of amalgam on the spotted areas, brush them lightly with a 2 per cent. solution of potassium cyanide; then when the stains disappear, wash with water until all the cyanide solution has been removed. By persistent rubbing, at cleanup times, from the edges of the stained area inward, the amalgam can in time be brought to thickly cover those areas. Silver-plated plates are less apt to become stained than plates of plain copper. A little sodium amalgam often helps matters, but its use is not attended by beneficial results if used too liberally.

The mercury should be cleaned by retorting, then washing in 10 per cent. nitric acid solution, stirring frequently. The acid, which dissolves the base metals and some of the mercury, should be siphoned off for use again. The mercury must be washed free from the acid before being used.

Using a Pump for Compressing Air

It is occasionally desirable to use a pump as an air compressor where only low pressures are required, when the work to be done is of only a temporary character and any makeshift will suffice. The scheme is shown in the accompanying illustration.

The drain valve is closed. The pump is then slowly started and when primed the air valve on the suction line is opened just enough to prevent the pump from entirely "losing its water." By proper regulation of this air valve the pump will take in a large volume of air with each stroke and just enough water to keep the plungers and valves fairly well sealed. When a pressure of 8 or 10 lb. is reached the air valve on the suction line is closed, the pump takes water and the receiver is nearly filled. This forces the air out of the receiver and increases the pressure at the same time.



PIPING FROM PUMP TO TANKS

Should more pressure be desired the air-outlet valve is closed and the receiver is drained into the suction tank. The small valve shown on top of the receiver admits air when the receiver is being drained. The operation mentioned is then repeated. Incidentally it is not the most economical way of compressing air.

To Make a Blueprint from a Drawing on Heavy Paper

In making a blueprint from a drawing inked in on heavy white paper such as Whatman's, two difficulties are to be overcome. One is the abnormally long time required for printing, and the other is that, on account of the great thickness of the paper, diffused light gets under the lines of the drawing and blurs the lines on the print.

There are several preparations on the market, according to *Shop Notes Quarterly*, with which to treat the drawing so as to increase the transparency, but to paint the drawing with these liquids makes it unpleasant to handle, although they serve the purpose of reducing the printing time, and on this account not so much light is diffused to blur the print.

A method of securing a sharp print is to place the drawing in the frame upside down, so that the lines are on the bottom, and use thin blueprint paper. Place the untreated side next to the drawing in order to get the print the right way, and not inverted as in a mirror. The light will thus have only the thin blueprint paper to pass through before reaching the prepared surface instead of the heavy white paper, and this will result in a sharp print. It takes just as long to print by this method, but a sharp print is secured without messing up the drawing by wetting it with some transparent medium.

Ventilating Stopes in Bisbee

BY F. W. HOLLER*

Ventilation in the Bisbee mines is natural as far as possible. Most of the shafts are connected on the different levels, and usually the levels are cool enough for comfort and the air is good. Levels are 100 ft. apart and are connected in many places by raises which are put up for prospecting purposes as well as to help the ventilation.

Before doing extensive stoping, a raise is put through from one level to the next. Then stoping is started from this raise, keeping the latter in the corner of the stope which will vary in size from a square section four sets on a side to one seven sets on a side. In some cases the raise ventilates the stope naturally. In other cases the air in the raise may be good, but a set or two away it may be just the opposite. In this event special methods of ventilation are necessary, and several of these follow: The manway set of the raise is covered over with plank on the working floor of the stope, and the floor is removed in one of the sets in the far corner of the stope, thus forcing the air to travel across the working floor, down into the far corner and back to the raise on the floor below. In this way two floors of a stope can be ventilated if there is a current of air in the raise.

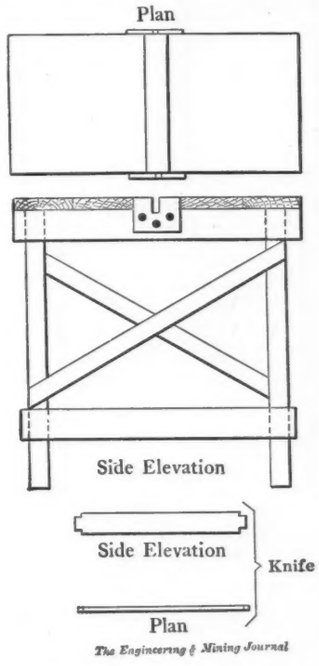
When there is not a current of fresh, cool air in the raise, small centrifugal blowers run by electric motors are used to blow air from a main air passageway to the stope. Six- or eight-inch galvanized pipe is used to conduct the air. Occasionally, compressed air is used in stopes where it is not deemed advisable to put in blowers. Results obtained are not good considering the power used and the quality of the air, but by using jets with the compressed air the results obtained are better; however, they do not compare with those obtained by using centrifugal blowers.

*Tonopah-Belmont Development Company, Tonopah, Nev.

Brick Cleaning Table

BY F. B. TOUGH*

The illustration shows a table that was designed for the purpose of rapidly cleaning mortar from bricks, and it has been found to work satisfactorily. It is especially valuable in a case where remodeling of a plant requires the immediate use of the old bricks. The table is about 18x36 in. in size, of moderate strength, and is covered with thin sheet or galvanized iron, excepting for a slot, 2 in. wide, which runs through the center of the table and across its width. In this slot a strip of hard steel, about 2x3/16 in. in cross-section and 18 in. long, is held in place, with its upper edge projecting ¼ in. above the surface of the table.



BRICK-CLEANING TABLE

The operation of the table consists merely in pushing the brick over its surface against the projecting knife edge; the latter scrapes off the mortar and dirt which drop through the slot to the ground. As illustrative of the capacity, it was found that one man at the table could clean as fast as one man with a wheelbarrow could supply, the latter working at a distance of about 50 ft. The table can be moved easily, is of simple construction, inexpensive, and the knife blade is the only part which requires attention.

*Resident geologist, Kern Trading and Oil Company, Coalinga, Cal.

Appraisal of Michigan Mines—I

By J. R. Finlay*

All profitable mines in the State are valued for taxation purposes. Estimates of results of future operations are based largely on past records furnished by the companies.

*Consulting engineer, 52 William street, New York.

This report of J. R. Finlay to the Board of State Tax Commissioners of Michigan embodies an appraisal of the mines within that State. The time consumed in actual field work and preparation of the report itself was limited to about three months, owing to a specified date on which the report was to be submitted. The purpose of the appraisal was to form a basis for tax valuation. The short period of time available and the peculiar purpose of the work combined to cause the adoption of the plan which was followed throughout. This plan consisted primarily of an estimate of future production for each mine, and therefore of the future earnings. The former factor was determined by the past-production record for the property in question and the evidence disclosed in the deepest level of the mine. The future net earnings were determined by using the estimate of future production and a net profit per unit of material produced, the latter being obtained by an inspection of the past records of cost of production per unit, a consideration of the future life and increasing depth of the mine and an average future market price per unit for the metal involved. The greater portion of the information was obtained directly from the mining companies in the form of answers to questions submitted. Stock-market quotations for the shares of stock of the companies were disregarded. The report follows:

Mr. Finlay's Report

The valuations in the accompanying table are based substantially on past and present earnings. During the last five years profitable copper mines earned $50,937,690 over expenditures, but I consider these earnings abnormal, being mainly due to the great boom of 1906 and 1907. In 1906 these mines earned $21,093,000, but in 1910 only $7,075,000. The iron mines earned in five years $57,551,202 without the benefit of any abnormal prices. In 1910 the earnings were higher than for the average. The total valuation of the iron mines is $119,485,000 based on an expected annual tonnage for all the districts of 10,922,000 tons and a total estimate of ore reserve of 195,041,809 tons. I feel justified in believing that while these tonnages are all that can be apportioned among the various properties with any degree of certainty, the various districts can be counted to produce ore somewhat as follows: Marquette range, 150,000,000 tons; Menominee range, 150,000,000; Gogebic range, 60,000,000; total, 360,000,000 tons. The reasons for these expectations are given to some extent in the comments on the various districts.

This is probably the first time any considerable valuation of Michigan iron mines has been made public. It will probably excite interest and the question will be asked: How nearly correct is it? My answer is that any man who concedes that it is logical to found expectations of the future on the results of the past will be forced to admit that these valuations are correct within a moderate range of error. It is to be remembered that the factors of cost and price are established by official and authentic documents, and that the life of the mines is also mainly established by the same kind of documents. The whole range of error lies in the mere extension of life that I have adopted as reasonable beyond what is plainly measurable. Now since the question is one of present values, it is demonstrable that my error in these extensions must be simply enormous before the error in valuation becomes considerable. The life of the mines is admitted to average 16 years. If I extend this life to 20 years, the increase of life is 25 per cent., but the increase of present value is only 15 per cent.

VALUATION BY COUNTIES

County	District	Copper	Iron	Coal
Keweenaw	.....	$12,200,000	.....	.....
Houghton	.....	57,315,000	.....	.....
Ontonagon	.....	300,000	.....	.....
Gogebic	No. 1	.....	$41,560,000	.....
Iron	2	.....	17,042,000	.....
	3	.....	6,297,000	.....
Dickinson	4	.....	11,391,000	.....
	9	.....	117,000	.....
Baraga	5	.....	335,000	.....
Marquette	6	.....	12,132,000	.....
	7	.....	27,825,000	.....
	8	.....	2,530,000	.....
	9	.....	256,000	.....
Bay	.....	.....	.....	$484,709
Saginaw	.....	.....	.....	350,924
Midland	.....	.....	.....	12,862
Tuscola	.....	.....	.....	3,500
Shiawassee	.....	.....	.....	9,750
Totals	.....	$69,815,000	$119,485,000	$861,745
Grand total	.....	.....	.....	$190,161,745

Theory of Appraisal

This report is a calculation of the value of mines to the permanent owner for the production of minerals. It is based on three factors: (1) average cost, (2) average prices and (3) an estimate of future life. The first two factors are determined by experience. The third factor, the life of the mine, is based partly on developed ore and partly upon an assumption of continuance of known orebodies beyond the present bottom levels of the mines. The assumption of continuance is based mainly upon the extent to which the continuity of the deposits has been proved for the district and for the type to which the mine belongs. It will be seen that these factors are quite as definite as those upon which calculations in the world of business are generally founded.

The future value of a series of dividends is reduced to a present value by the annuity method; that is, a sum is calculated upon which the series of dividends will pay 5 per cent. interest and also provide each year a sinking fund instalment which, invested each year at 4 per cent. interest, and added to prior instalments similarly invested and reinvested, will equal the sum taken. This sum is the amount which an investor can afford to pay for the property.

Value Based on Dividends

The following shows the present value on the above basis of a series of dividends for different periods: A single dividend of $1 payable at the end of a year is worth $0.95; a dividend of $1 continuing two years, $1.85; three years, $2.70; four years, $3.50; five years, $4.26; 10 years, $7.50; 15 years, $10; 20 years, $11.96; 25 years, $13.51; 30 years, $14.74; 35 years, $15.73.

Unprofitable mines have no value. The reasoning from these factors is pursued to its consequences. No definite value can be placed on any property for which any of the factors cannot be determined. Whenever the working of a mine proves that expenditures will equal or exceed receipts from product at average prices, the property has no value at all and it is appraised at zero.

Stock-market valuations are not considered. It will be observed that this method makes no mention of quoted values. It may be asked, and is asked, why it is that if the products of mines are valued by the process of purchase and sale, the mines themselves should not be so valued? If the price of wheat, copper and iron is fixed by the sales on an exchange, why not mining stocks? My answer is that wheat is good to eat. Like copper and iron it is a staple and necessary article, tangible and definite. The value of these commodities is universally recognized, whether they are quoted on exchange or not, and prices fluctuate only with the varying pressure of demand.

Stock Valuations Misleading

Mining stocks do not represent anything definite. Some pay dividends, in which case their quotations are comparable with those of other securities, but in the majority of cases mining stocks represent nothing more tangible than hopes. They fluctuate wildly as these hopes rise and subside. The very fluctuations make these stocks useful for gambling. People buy them not as serious investments, but as temporary speculations; often knowingly paying far more than they are worth, on the chance of selling them to somebody else for still more. In many cases this sort of thing has been organized into a business which depends not on any intrinsic value in the properties but wholly upon gambling. For this purpose the stocks are prized not because they are stable but because they are unstable. A notable instance of this is that of the famous Comstock mines of Nevada, which have scarcely paid a dividend in 30 years. On the contrary the assessments have reached astounding figures, probably over a score of millions. The assessments paid by stockholders merely take the place of prizes paid by lotteries, serving no purpose except to perpetuate the gamble. The public, of course, is fed with tales of the marvelous possibilities of these great mines and their past record is pointed to often enough. Still it is doubtful if much of these stocks is sold to a gullible public. They are mainly bought and sold by seasoned gamblers with whom it is a case of "dog eat dog."

While this is an extreme case it is wholly true that gambling forms an element to be reckoned with in every district where trading in mining stocks has become established. The copper district of Michigan is no exception. There are in it cases of terrific fluctuations in stock values. The Arcadian mine was valued at one time at $12,000,000; a few years later at $60,000, by stock quotations.

These reasons make it evident that the use of stock quotations in a serious appraisal of mining properties is illogical and beneath the dignity of a sovereign State. But, if the method is illogical it is certainly impracticable, because in Michigan the ownership of mines by stock companies, whose shares are traded in, is confined to a single district—the copper mines. The much more important iron mines are owned mainly by outside corporations or partnerships simply as so much private property. No available quotations apply to them even remotely. It is obviously necessary to use a method that will apply fairly to all properties throughout the State.

Valuation of Undeveloped Lands

It is plain that where no deposits have been worked and not even proved to exist, the definite factors which can be applied to the valuation of an active mine are lacking. In this case no definite appraisal can be made. A figure only represents a guess. I can see no way to come to any conclusion about such lands, other than to attempt such an analysis of the facts as may limit the range between which guesses will be reasonable. In this connection it seems desirable to discuss one or two points of difference between mining and other forms of business.

The mining business may properly be distinguishable on the ground that an essential preliminary is the discovery of a deposit in the crust of the earth that is inherently valuable. A sufficient quantity of rich gold ore in the remotest desert is valuable as soon as it is discovered. The discovery is valuable. The commercial problem of utilizing the ore can so certainly be solved that no one is much concerned about it. Such a deposit can only be valuable because it is limited in extent; consequently, its size and the time it will last are points of great concern and a most essential factor in the value that can be put upon it. With minerals less valuable and more common—less valuable because they are more common—the commercial circumstances of a discovery play relatively a more important part. A copper mine in the interior of Alaska is not valuable unless it is large enough and rich enough to pay for a railroad to reach it. An iron mine in the middle of the Sahara would have no value at all, even if a railroad ran across it. In other words, an iron discovery to be valuable must be within the range of certain commercial conditions. The value of coal is still more a question of mere environment. It is so abundant and can be mined at so many places that the question of an assured market is far more vital to commercial success than the discovery of a seam of coal. When we come to still more common minerals, such as limestone, salt, gypsum and brick clay, we find that they are so enormously abundant that the discovery of them excites no comment whatever. It is doubtful whether the discovery of salt, for instance, is of any value. The ocean is full of salt. Deposits are known in Michigan which would apparently supply the whole world for thousands of years. The utilization of such minerals, therefore, is wholly a commercial question, and I am disposed to draw a line between mines and other industries on the simple ground of whether the mineral rights on which they are based have value or not.

Many industries, which no one thinks of calling mining, use minerals and even mining processes. The Pennsylvania Railroad has for years been conducting the mining operations of shaft sinking and tunneling for the purpose of developing its terminals in New York City, but nobody calls the railroad a mine, or New York a mining camp. Similarly, we do not find a sufficient reason for calling the brickmaker and the cement manufacturer miners because the first digs clay and the second dredges marl. If, however, brick clay were a limited product valuable enough to make the mere hope of its discovery on a tract of land a sufficient reason for placing a higher value on that land than it would otherwise have, then we might properly call brickmaking mining. Some distinction of this sort appears absolutely necessary in order to differentiate intelligently between mining and a vast group of manufacturing industries that use minerals.

Valuable Mineral Lands

There are in Michigan large tracts of land highly prized for their possibilities of containing valuable mineral deposits. These lands are mostly in the iron and copper regions of the Upper Peninsula. It has been a large feature of the work connected with this appraisal to tabulate the ownership and distribution of such lands, and attention has been given to the problem of working out a scheme of valuing them on a rational basis. The results will be taken up later in connection with the specific reports on the iron and copper fields. It is only worth while to point out here that the iron and copper ores of the Upper Peninsula have proved so valuable that their mere discovery carries a high commercial value. The mere chance of making such a discovery on a given tract of land is distinctly an asset. This is particularly true in the iron regions where the ores occur in masses of rock which are so unique that they can be instantly recognized, and in which the probability of discovery of merchantable ore is considerable. The finding of the "iron formation," therefore, can be considered a partial discovery of ore, and it is undeniable that lands containing it have in the aggregate commercial value; a value that is not speculative but actual. But since we are now speaking of lands on which no merchantable discoveries have been made, we must admit that a valuation which may be reasonable for the aggregate of such lands may be wholly mistaken when applied to any particular tract.

Mining Plants Not Appraised

The value of a mine depends wholly upon the ore; that is, the equipment of a mine has no value except as applied to the ore. It is, therefore, useless to appraise mining plants as if they were in themselves an asset. It is true that a mine cannot be worked without equipment. A mine fully equipped is more valuable than a mere orebody without equipment, but this fact is fully taken into consideration in all appraisals. The point to be borne in mind, especially, is that mining equipment in itself is of no value; when the ore plays out the equipment is mere junk, no matter how costly it may have been in the first place; and this junk is so likely to be unsalable that it is fully as likely to entail expense for watchman and insurance as it is to yield any salvage. This fact may be surprising to many people, but a little consideration will show that it is logical. The equipment of a mine consists very largely of structures that cannot by any possibility be moved. The shafts and all other excavations are a part of the equipment. The buildings and machinery may occasionally yield some salvage, but necessarily a small amount. It must be borne in mind that a large part of the expense of any installation of machinery consists of labor and materials for foundations, housing and erection. This is wholly lost when it is proposed to move the machine. Furthermore, the value of a machine depreciates rapidly on account of mere age. The valuations in this report are intended to cover the value of the mining business of a company in each case. It includes all value that can be put on mineral lands and mining, milling and smelting equipment and mining supplies. It does not include property that can be valued for purposes other than mining, such as surface rights of any kind, agricultural or timbered lands, houses, stores, merchandise or cash.

Examination of the Copper District

As soon as an office for conducting correspondence could be established at Houghton, about June 1, the work of securing information about the copper mines was actively commenced and an attempt was made, which proved entirely successful, to secure authoritative data on, (1), the cost of mining, and (2), the prospects for future ore as disclosed by the maps of the various mines. Much information on the first subject could be gained by an examination of the published official reports of the various companies, the results of which were tabulated. To reinforce this information, the following questions were sent to each of the copper companies, and similar ones to the iron, coal and miscellaneous mining companies, with a request for the name of the company and its officers.

In case the company operated several separate mines, the answers were to be made separately for each of them, specifying the name of the mine.

(1) How many men employed; include all classes up to the general manager.

(2) What is the sum total of wages and salaries paid for each of the last five fiscal years?

(3) Tons rock stamped for each of last five fiscal years?

(4) Pounds of refined copper produced in each of last five fiscal years?

(5) Price received in total dollars and per pound copper for all copper sold in each of the last five fiscal years?

(6) Cost of production in dollars and per pound of refined copper for each of the last five fiscal years specifying the following items: (a) Mining, transportation and stamping; (b) exploration (diamond-drilling, test pitting, etc. looking for new ore); (c) development (shaft-sinking and opening work not charged directly to mining); (d) smelting, refining, freight and commissions; (e) construction (include all amounts spent on mining, milling or transportation equipment for the use of mines, but nothing for purchase of lands, real estate, etc.); (f) general expense (taxes, insurance, interest, administration and miscellaneous items not included in above); total.

DIVIDEND AND PRODUCTION TABLE

Year	Dividends	Price Received by Quincy Mining Company	Product in Pounds
1890....	$3,415,000	15.7	101,410,000
1891....	3,540,000	12.8	114,223,000
1892....	3,260,000	11.2	123,198,000
1893....	3,520,000	10.4	112,605,000
1894....	2,380,000	9.5	114,309,000
1895....	3,280,000	10.1	129,331,000
1896....	3,985,000	10.9	142,057,000
1897....	5,431,900	11.1	142,703,000
1898....	6,857,250	12.0	147,968,000
1899....	12,318,450	17.0	146,950,000
1900....	9,811,000	16.6	142,152,000
1901....	7,496,000	16.1	115,717,000
1902....	3,440,000	11.9	170,326,000
1903....	4,980,000	13.2	192,299,000
1904....	5,432,000	13.3	208,356,000
1905....	9,224,000	15.8	230,438,000
1906....	13,811,000	19.15	229,633,000
1907....	13,469,000	18.04	216,117,000
1908....	4,837,000	13.35	222,675,000
1909....	6,309,000	13.2	220,000,000
Total	$128,796,200	274.34	3,262,464,000
Average.	6,439,800	13.7	163,123,200

(7) Describe, specifying township, range, section and subdivision of section, of each tract owned or operated by the company on which mining operations are now being conducted.

(8) State how many tons of copper-bearing rock and how many pounds of refined copper may reasonably be expected in future from each of these tracts.

(9) Describe as above any tracts owned by the company known to contain payable copper rock, but which are not now being mined.

(10) State how many tons of copper-bearing rock and how many pounds of refined copper may reasonably be expected in future from these tracts.

(11) Describe lands owned by the company which are situated upon recognized copper-bearing formations, but which are not known to contain payable ore.

(12) State ownership of company in other corporations connected with the copper business, such as smelting and transportation companies.

(13) State ownership in acres, but without detailed description of nonmineral lands and other property not inherently a part of the mining business of the company.

The answers were to bear the signature of president, secretary or general manager.

Mr. Hague examined the maps of all of the principal companies with great care. I examined them myself with less attention to details but sufficiently to verify the principal facts. Together we went underground in some of the mines for the purpose of checking at some points the accuracy of information supplied by the companies' documents. The circulars were replied to in a satisfactory manner, and I hand them to your board, with comments in each instance. The total result of our inquiries was satisfactory, for the information secured was quite sufficient to disclose the essential facts required for a valuation of the properties. I shall attempt nothing further here than to make a review of the conclusions arrived at.

Determining Price of Copper

For the purpose of appraising the copper mines, I have decided to apply to the future a price of 14c. per lb. This is considerably above the price ruling during the summer of 1911. The Calumet & Hecla Mining Company states that the actual sum received for all copper produced by that concern from 1878 to 1910 inclusive has been approximately 13½c. per lb. For the 20-year period from 1890 to 1909 inclusive the average price of a given amount of copper sold each year by the Quincy Mining Company was approximately 13.7c. per lb. As there seems to be some evidence that the Quincy sesures a slightly higher price than the other lake companies, this would give ground for taking 13½c. as a fair figure. The price fluctuates considerably, as will be seen from the accompanying table taken from Horace J. Stevens' "Copper Handbook," edition of 1909. This table shows the product in pounds of the Lake Superior mines for the years 1890 to 1909 inclusive, the dividends paid by the various companies for the same years and the price reported by the Quincy Mining Company for these years.

Price of Copper is Rising

My own belief is that the average price of copper is tending to rise. This opinion is based upon some considerations much more complicated than the above. It appears that for the last 50 years the price has fluctuated widely. Periods of high

prices have occurred at an average interval of about eight years, separated by intervening periods of lower prices. The average price of lake copper in 1864 was 47c.; in 1870 it had fallen to 21.19c.; in 1872 it had risen to 35.56c.; in 1878 it fell again to 16.56c.; in 18°0 it rose to 21.44c.; in 1885 it fell again to 10.84c.; in 1888 it rose to 16.78c.; in 1894 it was 9.52c.; in 1899 it was 17.76c.; in 1902 it was 12.16c.; in 1907 it was 20c.; in 1910 it was 13c. From these fluctuations it is possible to argue that the price on the whole was falling from 1864 to 1894, but since that time it has tended to rise. Following the high price of 1899, the average fell in 1902 to 12.16c., but in 1910, following the much more severe panic and depression of 1907, the average price has declined only to 13c. It remains to be seen what the average for 1911 will be. One might assume from these figures that the price has risen at least 3c. per lb. since 1904, because, following the panic of 1907, the price has not fallen to within 3c. per lb. as low as it fell in the depression following the panic of 1893. It is also probable that another wave of high prices will culminate about 1915.

Price of 14c. per Lb. for Copper

Furthermore, for the period of 15 years, 1896 to 1910, inclusive, the average quotational price was 14.3c. For the decade ended 1905 the average was 13.79c.; for that ended 1906, 14.515c.; for that ended 1907, 15.309c.; for that ended 1908, 15.444c.; for that ended 1909, 15.066c.; for that ended 1910, 14.702c. The trend of these figures is such that the stockholder in a long-lived copper mine has reason to hope that the average price for the future, taking a period of 10 or 12 years, will be, perhaps, 15c. per lb. My conclusion in 1909, after making a rather exhaustive study of the copper-mining business, was that the average price for the 10 years following would be 15.5c. per lb. These figures and deductions seem to bear out the conclusion that a price of 14c. is conservative for any mine that will last 10 years. I have tried to avoid adopting a figure so high that it might be attacked as a mere personal opinion. Some copper companies believe that 13.5c. is a fair average, and will, perhaps, be disposed to argue that 14c. is unreasonably high. On the other hand, I am convinced that even 14c. is low, and I am adopting it only from a desire to be conservative. The average for the five years reported for this appraisal was 15.3c. But this high average is explained by the effect of the abnormal prices of 1906 and 1907.

Much stress has been laid on the overproduction of copper, due to bringing in of numerous new mines during the last few years. The situation, however, is far from terrifying, as consumption is increasing at the rate of 100,000,000 lb. per year. It appears that at the beginning of 1911 the expected increase of production from new mines would amount to about 300,000,000 lb. per year. This is only sufficient to meet the increase of demand for three years. After that period is passed the prospects for a scarcity of copper are fully as good as that new sources of supply will be added. The discovery of new deposits has practically ceased on the North American continent. Even the so called porphyry deposits, which have been opened in the States of Utah, Nevada, Arizona and New Mexico within the last 10 years, are not strictly new. Their rapid exploration has been rather the result of finding how to treat them successfully. Since that was accomplished, an urgent search has been made for further deposits of this type (which is not essentially different from that of the Lake Superior copper mines), but with no success.

Cost of Production

Claims have been widely published by the promoters of these porphyry mines that they could produce copper cheaper than older mines in other districts. This claim will not stand analysis. So far as costs are concerned, the porphyry mines are in essentially the same situation as other mines. Some can produce copper cheaply and others cannot. It is highly doubtful if their average cost will be even as low as that in the Lake Superior district.

I recite these facts not to cast any doubt on the value of the new mines in the West, for they undoubtedly contain the greatest reserves of available copper known in the world today. But it is easy to overestimate their effect on the commerce of the world. These new mines are not by any means so likely to disturb the copper business as the discovery of the Mesabi range in the early 90's was likely to disturb the iron business of the Lake Superior region. For a few years after the opening of that remarkable district the supply of iron ore seemed so great that people had no confidence in its value and iron mines in Michigan were a drug on the market. The disturbance, however, proved to be of short duration, and since 1898 the expansion in demand for iron ores has not only absorbed the enormous production of the Mesabi range, but has actually allowed the older mines to increase their annual production 50 per cent.

The Paying Copper Mines

Only nine copper companies in Michigan have made money during the last five years. Their actual earnings were $50,937,690 with copper averaging 15.3c. per lb. Had the metal averaged 14c., the earnings would have been $41,200,000. This would be $8,240,000 per year. The accompanying large tabulation gives details of the cost, production and profits of these mines for the last five years and an estimate of their probable future production and present value.

If we could assume that these mines would last forever, the investor would probably be satisfied with 5 per cent. income, and he would probably capitalize their average earnings of $8,240,000 into a present value for the group of $164,800,000. The fact is that these mines are not worth even a half of this amount, because their future life is not by any means perpetual. On the contrary, their future is much less promising than it is popularly supposed to be. These mines have shown unusual persistence in depth, but the limit of profitable working is now in most cases in plain sight. It must not be forgotten that the tonnage maintained now is three times as great as the mines have averaged in their 50 years of life.

Calumet Conglomerate Has Failed at Depth

It will be observed that the Tamarack mine is not in the list of profitable companies. This mine has become worthless because the Calumet conglomerate, by far the richest deposit in the whole district, has failed in depth. The Tamarack owns an irregular tract immediately below the Calumet & Hecla mine and including the whole downward extension of the great lode which has enabled that property to pay $115,000,000 in dividends. In the upper portion of its mine the Tamarack was able to earn handsome profits and it paid up to 1906 a total of $9,420,000 in dividends. Since then it has uniformly lost money because the ore no longer yields enough copper to meet expenses. The depth at which the lode became unprofitable was approximately 8000 ft. on the slope. If this richest of all the deposits has played out in this manner it may be taken as a sure inference that inferior lodes will play out at lesser depths.

In order to give a more comprehensive view of the whole situation, I shall describe briefly the principal deposits which are now being worked with success. There are only six lodes supporting profitable operations, namely, the Kearsarge, Osceola, Pewabic, Isle Royale and Baltic amygdaloids and the Calumet conglomerate.

Kearsarge Lode

Beginning at the northeast end of the district we have first the Kearsarge amygdaloid, on which are situated the Mohawk, Ahmeek, Osceola Consolidated, Allouez, Wolverine and Centennial mines. This is the longest lode in the district. It dips northwestward at an angle of about 37 deg. Its thickness is about 12 ft. Its length is five miles. While this vein is mineralized quite uniformly for the above length there are two areas or oreshoots that are distinctly richer than the average. These occur on the Wolverine and Ahmeek properties. These two enrichments

FIVE-YEAR OPERATING RESULTS OF MICHIGAN COPPER MINES THAT PROMISE TO BE PROFITABLE IN FUTURE

Company	Years	Pounds of Copper Produced	Tons of Rock Stamped	Yield per Ton, Lb. Cu.	Receipts			Expenditures					Cost	Average Price	Profit	Loss
					Sale of Copper	Other Sources	Total Receipts	Mining, Transportation and Stamping	Smelting, etc.	Construction	General	Miscellaneous Expense	Total Expense	C. per Lb.			
Calumet & Hecla	5	410,614,189	13,185,376	31.2	$61,313,175	.....	$61,313,175	$26,850,772	$4,684,975	$2,889,570	$2,237,379	.....	$36,662,696	8.95	15.8	$24,650,479	.....
Mohawk	5	52,415,939	3,566,699	14.7	7,776,689	$13,711	7,790,401	5,654,197	incl. mining	incl. general	285,943	.....	5,940,140	11.35	14.85	1,850,260	.....
Ahmeek	5	35,911,797	1,722,281	20.9	5,134,776	.....	5,134,776	2,666,833	411,804	1,226,945	145,192	(a)$335,242	4,786,018	13.30	14.30	348,758	.....
Allouez	5	17,355,301	1,114,085	15.6	2,762,507	22,558	2,785,066	2,240,044	incl. mining	702,950	incl. const.	.....	2,942,995	17.00	16.00	.....	(b)$157,928
Wolverine	5	48,163,660	1,799,273	26.7	7,521,329	50,459	7,571,788	3,396,207	incl. mining	125,949	incl. const.	(c) 153,361	3,675,517	7.65	15.60	3,896,270	.....
Osceola Con.	5	98,617,221	5,781,808	17.2	14,663,437	416,946	15,080,383	9,065,882	incl. mining	562,220	incl. const.	.....	10,228,103	10.53	15.2	4,852,280	.....
Quincy	5	101,620,255	not given	(h) 16	15,681,637	106,811	15,788,448	9,735,008	950,419	747,659	incl. smltg.	.....	(d) 11,433,086	11.30	15.45	4,355,362	.....
Isle Royale	5	21,902,821	1,508,740	14.6	3,117,242	169,445	3,286,688	2,960,860	incl. mining	945,681	incl. const.	.....	3,906,541	17.80	14.20	.....	(e) 619,852
Superior	5	6,278,707	287,126	21.8	505,922	(f)	505,922	897,032	88,572	75,913	140,210	.....	1,201,727	19.20	.....	.....	695,804
Baltic	5	84,194,877	3,771,016	22.3	12,572,826	.....	12,572,826	5,772,872	894,248	543,092	268,948	.....	7,479,161	8.9	14.8	5,093,564	.....
Trimountain	5	34,710,824	1,926,936	18	5,500,479	.....	5,500,479	3,667,528	421,146	151,906	217,835	.....	4,458,417	12.8	15.6	1,042,062	.....
Champion	5	88,460,380	3,651,132	24.2	13,252,629	.....	13,252,629	6,093,677	950,725	751,395	333,626	(i) 26,063	8,155,488	9.25	15+	5,097,141	.....
Lake	3	318,050	14,847	21.5	(g) 3,767	(f)	3,767	25,982	2,495	161,719	58,341	(j) 223,719	472,256	.....	18.2	.....	468,488
Atlantic	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	(k) 372,458	372,458	.....	.....	.....	372,458
Total		1,000,564,021	38,329,319	26.2	$149,806,420	$779,932	$150,586,353	$79,626,898	$8,404,386	$8,885,002	$3,687,476	$1,110,844	$101,714,607	10.1	14.98	$51,186,270	$2,314,531

(a) Development not charged to mining; (b) not a loss if stamp-mill item is not included; (c) to cover overestimate of value of copper previous year; (d) purchase of lands not included. (e) purchase of lands included. Cost of copper per pound about 16.7c. if not included; (f) from report to tax commission and not from annual reports; (g) unexplained; (h) approximate; (i) interest; (j) exploration and development; (k) exploration.

appear to be substantially of the same size and character, but apparently the Wolverine orebody is the richer.

Wolverine and Ahmeek Costs

The Wolverine has been able to maintain a yield of about 27 lb. of copper per ton, but there has been some decline. At first the rock yielded 30 lb., but it has now gone down to about 25 lb. per ton. The conditions for cheap mining are ideal and the Wolverine has been able to produce the cheapest copper of the district, its cost being less than 8c. per lb. The Ahmeek mine is much younger and is just arriving at its most profitable stage. It has been securing about 22 lb. of refined copper per ton and has brought its tonnage up to about 550,000 tons of ore per year. I calculate that this mine will have to spend considerable money for further construction and development in order to bring its output up to about 800,000 tons of ore per year. Including the probable expenditures for construction, I estimate that the mine can produce copper at slightly over 9c. per lb. for the next 10 years.

Total Yield of Kearsarge Lode

The other mines on this lode are not so good, although the South Kearsarge branch of the Osceola Consolidated seems to have a portion of the Wolverine oreshoot. We may calculate with certainty that part of the Kearsarge lode will prove profitable down to a depth of at least 6000 ft. It is not an unfair supposition that at least 60 per cent. of its area will be mined to that depth and will produce 16 lb. per ton. Mr. Hague has estimated that at a depth of 2000 ft. on the slope the lode is yielding an average of 18 lb. per ton, but that the yield may be expected to diminish with greater depth.

It is probable that the lode will be able to produce, to a depth of 6000 ft., about 90,000,000 tons of ore, of which about 20,000,000 tons have already been mined. This would leave 70,000,000 tons to be taken out.

The tonnage apportioned among the various properties is as follows: Wolverine, 3,600,000 tons; North and South Kearsarge, 21,000,000; Centennial, doubtful; Mohawk, 12,000,000; Allouez, 10,000,000; Ahmeek, 17,000,000; total, 63,600,000 tons. The distribution of copper still to be produced is as follows: Wolverine, 80,000,000 lb.; Osceola Consolidated, 300,000,000; Mohawk, 176,000,000; Allouez, 140,000,000; Ahmeek, 290,000,000; total, 986,000,000 lb. This is probably as near correct a tonnage as can be apportioned among the dividend owners.

Method of Valuing Mohawk Mine

The valuation put on these various mines, beginning at the north end, is as follows: Mohawk, $3,500,000; Ahmeek, $7,200,000; Allouez, $1,500,000; Wolver-

ine, $3,700,000; Osceola Consolidated, $6,000,000; total, $21,900,000. The method of arriving at this apportionment is as follows: The Mohawk mine has a surface area covering the Kearsarge lode of about 480 acres, this being the upper portion from the outcrop down to the Ahmeek line, which will be reached at an average depth of 2500 ft. along the slope. About 70 per cent. of the territory so far explored appears to be mineable and yields about 55,000 tons of ore, or approximately 800,000 lb. of copper per acre. On this basis approximately 330 acres, containing 264,000,000 lb. of available copper, was the full measure of production possible in this territory before mining began. About 88,000,000 lb. have been already removed, leaving for the future a tonnage of about 176,000,000 lb. This can be mined in approximately 15 years at a cost of 11c. per pound and at a profit of 3c. per pound, giving a total profit of $5,280,000 and a present value of $3,500,000.

Wolverine Mine

Going now for convenience to the Wolverine mine we find that it has a surface area covering the lode of about 215 acres. The total production to date has been approximately 107,000,000 lb. and the future production will be 80,000,000 lb. This can be mined in nine years at 8c. per lb., leaving a profit of 6c. per lb. and a total profit of $4,800,000, and a present value of $3,700,000.

Valuation of Ahmeek Mine

The fairest method of measuring the probabilities of the Ahmeek mine is to compare it with the Wolverine and Mohawk mines combined. The reason for this is that the Ahmeek contains, as mentioned above, a rich portion of the vein comparable to that of the Wolverine, but not so rich. It contains only 22 lb. of copper per ton, against 27 lb. for the Wolverine. A large part of its territory is simply a downward extension of the lode from the Mohawk property.

The total area of the Ahmeek property covering the Kearsarge lode above a depth of 6000 ft. on the slope is 660 acres, against a combined acreage of 695 acres for the Mohawk and Wolverine. I do not believe that the Ahmeek property is likely to produce more than 75 per cent. as much copper as the two properties combined. The rich tract is approximately 80 per cent. as rich as the Wolverine. The portion underlying the Mohawk has the pronounced disadvantage of containing only the deep levels. I, therefore, base my valuation of the Ahmeek mine on the assumption that it will produce three-quarters as much copper as the Mohawk and Wolverine combined. This will give us about 335,000,000 lb., of which 45,000,000 lb. have been mined, leaving 290,000,000 lb. to be extracted. It is a fair assumption that of this 150,000,000 lb. will be produced during the next 10 years at an average cost of a trifle over 9c. per lb., making a total expected profit in that period of about $7,500,000 and a present value for that period of about $5,500,000. The remainder, 140,000,000 lb., will probably be low grade, costing 11c. per lb. and making a profit of $4,200,000 for a period of 12 years following the first 10 years. The present value of such an expectation is about $1,700,000, so that the maximum valuation of the Ahmeek is $7,200,000.

North and South Kearsarge Mines

The Osceola Consolidated owns the North and South Kearsarge mines. The North Kearsarge is poor like the Mohawk. Without going into details, the total expectation is about 21,000,000 tons, containing about 300,000,000 lb. of copper. This can be mined in 15 years at a profit of 3c. per lb., totaling $9,000,000. This would give it a present valuation of approximately $6,000,000.

Allouez Mine

The only remaning mine on the Kearsarge lode that can be classed as profitable, the Allouez, may be counted on for about 10,000,000 tons and 140,000,000 lb. of copper. The operating record to date of this mine is not very flattering, costs for the last five years being 15c.; but in 1910 it got down to 11.6c. This mine has only two shafts, which gives it a maximum producing capacity of 400,000 tons per year. At this rate it will take 25 years to exhaust the property, and it is not safe to count on the cost of copper at less than 12c. per lb. We have then a total of $2,800,000 profit to be expected in 25 years. This gives the mine a present value of only $1,500,000.

(To be continued)

Chile Nitrate Industry

The nitrate of soda year in Chile, which closed June 30, 1911, was fairly prosperous, according to Consul Alfred A. Winslow, the production reaching 54,297,531 Spanish quintals (of 101.42 lb. each), a gain of 1,237,277 quintals over the last nitrate year. During the year the price of nitrate on this coast advanced from $1.64 United States gold per Spanish quintal for July, 1910, to $1.84 per quintal for July, 1911.

During the nitrate year three new nitrate works opened for business, making 158 ready for work on June 30, 1911, and others are under construction, with a view of bringing the production up to at least 55,500,000 Spanish quintals during the present nitrate year. During the last nitrate year the United States greatly increased the imports of nitrate from Chile, and it seems from present indications that the year to come will be another record breaker.

Lake Superior Mining Institute

The sixteenth annual meeting of the Lake Superior Mining Institute began at Crystal Falls, Mich., on Aug. 22, with 230 members present. Business and technical sessions were held at Crystal Falls on Tuesday evening, and at Iron River on Wednesday afternoon.

The Menominee range is divided naturally into three districts, and to each place one day of the meeting was given.

At Crystal Falls on Tuesday, following lunch, a visit was made to M. A. Hanna & Co.'s Hollister mine. This property has been producing a wet, undesirable ore, and the object of interest was the tube-mill ore-drying plant which has been installed. The mill has a capacity of 15 tons per hour, or 300 tons per day of two 10-hour shifts. Results thus far obtained show a reduction of the moisture to about 6½ per cent., and it is expected that a maximum moisture of 5 per cent. will soon be possible. From the Hollister, trips were made to the Bristol, operated by Ogleby, Norton & Co., and to the Tobin mine, owned by Corrigan, McKinney & Company.

The evening meeting was held in Crystal Falls, with President W. J. Richards presiding. A paper was presented by C. E. Lawrence, general superintendent for Pickands, Mather & Co., in the Iron River-Stambaugh district, in which he described the welfare work done by that company. This paper was followed by an interesting illustrated description of the work being done to safeguard employees and of the safety devices being installed and developed by the Oliver Iron Mining Company. It was presented by A. M. Gow, assistant mechanical engineer of that company.

On Wednesday morning a cross-country automobile drive was made from Crystal Falls to the Iron River district.. The second Institute meeting was held on Wednesday afternoon. A considerable portion of the time was given to a discussion in which it was attempted to bring out more clearly the distinctions between the methods of mining employed at the several mines, and on the other hand, to show that mining systems considered locally to be peculiar to certain mines were essentially forms of the generally practiced systems. An analysis of two papers presented, one by W. A. MacEachron, describing the top-slicing and caving systems in operation at the Caspian mine, and the other the sub and caving system practised at the Tobin mine, by F. C. Roberts, was offered by Prof. F. W. Spurr, of the Michigan School of Mines, at Houghton.

E. E. White, of Ishpeming, described the results obtained by the use of the clinometer, a device perfected and extensively tested by the Cleveland-Cliffs Iron Company in surveying diamond-drill

holes. Thos. B. Wyman, of the Forestry Service, presented a paper in which he analyzed the several causes of forest fires and the proportion of fires for which each was responsible. Other papers included in the program were read by title only.

In offering a resolution submitting to the Institute the question of closer affillation with other societies, William Kelly introduced Charles Kirchoff, New York, president of the American Institute of Mining Engineers. Mr. Kirchhoff spoke of the advantages of team work among the various societies by means of which the local advantages of each might be pooled to the profit of all. The meeting closed with a business session, during which, by unanimous acceptance of the report of the nominating committee, F. W. Denton, of Houghton, Mich., was elected president for the ensuing year and E. W. Hopkins and A. J. Yungbluth were reëlected treasurer and secretary respectively. In the evening the members were entertained by the Iron River committee at Sunset lake with a clam bake.

On the last day the trip included visits to the Loretto mine at the east end of the range, to the Penn Iron Mining Company's group at Vulcan, and to the Chapin mine at Iron Mountain. The Loretto mine workings extended directly under the Sturgeon river and it became necessary, both from the standpoint of safety and to save the pillars of ore supporting the roof of the mine, to divert the river. A new channel running around the mine to the west was completed in 1909. At the Vulcan group advantage has been taken of the waterfall where the Sturgeon river joins the Menominee, and a water-driven electric generating station has been built. Current is carried the few intervening miles to the mines where the hoisting plants are driven by motor and rope drives, and the pumps are direct-connected motor-driven centrifugals. This plant is interesting as contrasted with the water-power plant at Quinnesec Falls, where compressed air is generated and transmitted to the Chapin mine through steel pipe to be used for operating the hoists and pumps. At the Brier Hill mine, which is a part of the Vulcan group, bad surface conditions made advisable the lining of the shaft with concrete instead of timber.

Although completed in 1908, the C Ludington shaft of the Chapin mine has been sunk since the last visit of the Institute. It was one of the first of the steel-frame shafts on this range and was put down to handle the entire output of the Chapin mine, the trend of whose orebodies is deeper in the direction of this shaft. It is down to the 17th level at a depth of 1522 ft. Of interest at this shaft is the old Cornish pump, known almost as widely as the Chapin mine itself. It is a compound, walking-beam engine with a capacity of 3000 gal. per minute, pumping from a depth of 1500 ft., and is still in active service while at the same time a relic of earlier practice. The Institute will meet in the copper country next year.

Michigan Copper Refining Practice

The present practice of using separate furnaces for the melting and refining of Lake Superior copper has allowed charges of over 300,000 lb. of copper to be poured.[1] The melting furnaces have broad, shallow hearths; the refining, narrow, deep hearths. A large charge is put in the melter, and, when ready, is run over into the refiner, where a small charge has also been melted. The melting furnace is then immediately recharged, and has all the time for melting that the other furnace consumes in refining. After the charge is refined and poured (by the customary Walker wheels) a charge of "mineral" is put in the refining furnace, small enough to melt in time to receive that in the melter and still swing the charge in 24 hours.

The slags produced by these Michigan reverberatories contain from 15 to 30 per cent. copper and may be acid, i.e., 40 per cent. SiO_2 and 20 per cent. Fe_2O_3 if produced from amygdaloid mineral; or basic, 20 per cent. SiO_2 and 45 per cent. Fe_2O_3 if produced from conglomerate. In either case they are smelted in cupolas using limestone and iron or silica flux as needed, and a mixture of coke and anthracite coal as the reduction agent. They are internal-settling furnaces with deep crucibles, and run with a blast pressure of only about four ounces per square inch, as it has been found most economical to run at low blast pressure. in order not to have undue slag losses. The furnaces are rectangular, from 40 to 48 in. wide and eight to 12 ft. long, and have shafts seven to 10 ft. high. The blast is trapped, and slag runs continuously, while copper is tapped intermittently.

Gas Ignition Temperatures

The temperatures of ignition of different gases were determined recently by H. B. Dixon and H. F. Coward (*Journ.* Chem. Soc. of London, Vol. 95, p. 514).

GAS-IGNITION TEMPERATURES

Gas	In Oxygen, Deg. C.	In Air, Deg. C.
Hydrogen	580–590	580–590
Moist carbon monoxide	637–658	644–658
Cyanogen	803–818	850–862
Ethylene	500–519	542–547
Acetylene	416–440	406–440
Sulphuretted hydrogen	220–235	346–379
Methane	556–700	650–750
Ethame	520–630	520–630
Propane	490–570	.....
Ammonia	700–860	.....

The results, as determined under a pressure of 760 mm. of mercury, are given in an accompanying table.

[1] "Copper Smelting in Michigan." By H. D. Conant, *School of Mines Quarterly*, July, 1911.

A New Form of Stamp Cam

With the double object of increasing the speed of stamps and the distance through which they drop, Henry Bolthoff, of Denver, Colo., has patented (U. S. pat. No. 995,436, June 20, 1911) a cam to be used for operating stamp mills.

By referring to the accompanying illustrations, it will be noticed that the cam arm is considerably shorter and steeper than the usual type, thus permitting the tappet to drop to a lower point than usual. Furthermore, it is not picked up by the cam as sharply as when the usual cam is used, thus permitting a more rapid speed. Another peculiar feature of the cam is that, in addition to the two cam arms supported by each section of sleeve, two flanges are provided for the purpose

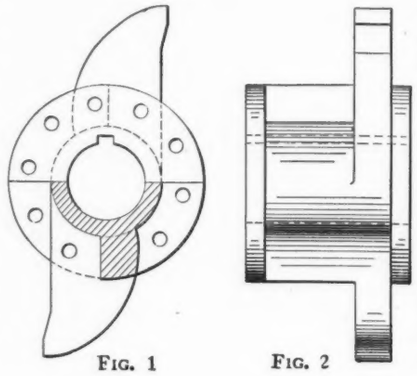


FIG. 1 FIG. 2

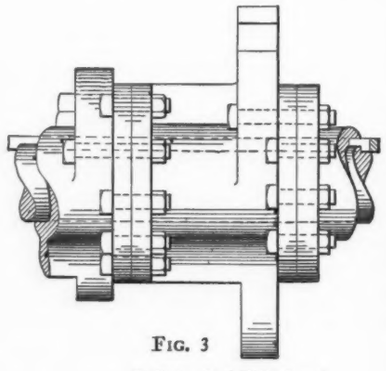


FIG. 3

The Engineering & Mining Journal

A NEW STAMP CAM

of applying the first lift to the tappet. On account of the shorter lever arm and the comparative straightness of the upper surface of this flange, the tappet is raised from its position of rest quickly and without excessive effort; this occurs before the cam itself comes into operation, thereby greatly increasing the smoothness and rapidity of the operation. The flanges are provided with bolt holes, so that the five necessary pairs of cams can be bolted together longitudinally, as shown in Fig. 3, so as to form a practically continuous reinforcement around the cam shaft. A key is inserted throughout the entire length of the shaft in order to distribute the torsion.

Trinity River Gravels, California

Trinity River basin almost entirely within Trinity county. The auriferous gravels have been worked since 1850 by hydraulicking and dredging. Large low-grade areas remain to be worked on large scale.

NOTE—Abstract of a paper by J. S. Diller in Bull. 470-B, U. S. Geol. Surv.

The Trinity River region in northwestern California has long been worthily noted for its placer mines, the working of which opened with a rush in the early '50's and has continued with more or less regularity ever since. Besides the La Grange mine, the largest hydraulic mine now in active operation, it contains the Hupp, the Union Hill and a number of other hydraulic mines, particularly in the northern portion of the county. Large bodies of gravel of lower grade yet remain. Those near the river level are now being attacked by dredges as at Trinity Center and Poker Bar, and the outlook for the future is encouraging.

The Trinity River basin lies wholly within the southern part of Klamath mountains. The course of Trinity river is roughly crescentic, concave to the north. The right arm represents the south and southwest upper course of the river to Douglas City, where the stream turns and flows northwestward to the Klamath. The basin is bordered by prominent mountains some of which rise to elevations over 8000 ft. The Trinity River basin embraces the whole of Trinity county, except the south end, and also the part of Humboldt county about the Hoopa reservation, the total area being nearly 3000 square miles.

THREE CYCLES OF EROSION

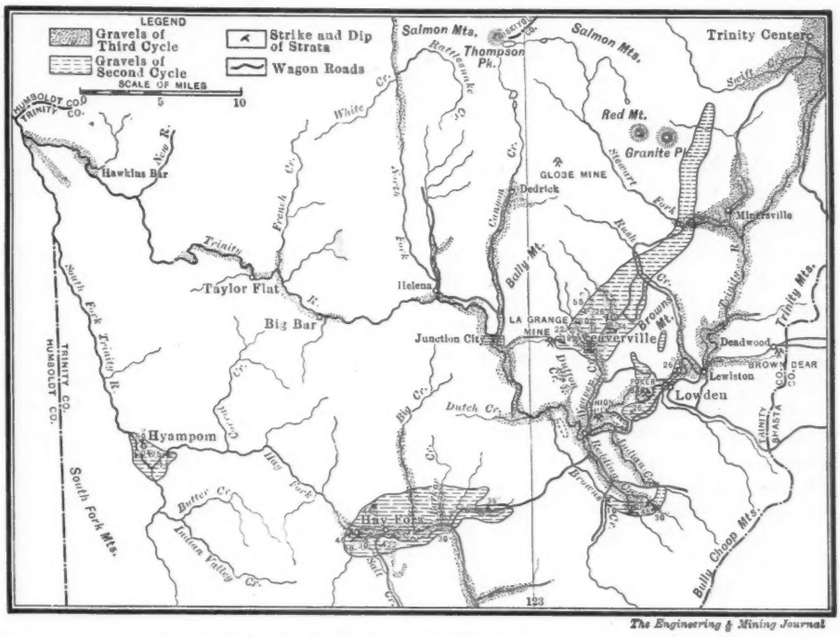
The even crest of the South Fork mountains is part of an ancient plain of erosion extensively developed in the Klamath mountains and hence called the Klamath peneplain. This plain is the result of the first cycle of erosion recorded in the topography of that region. Trinity river and its branches, rejuvenated by the uplift, deepened and widened its valley during the second cycle of erosion until a second plain of erosion was produced within the borders of the Trinity basin. This second plain appears to correspond to the Sherwood peneplain on the coast. The Sherwood peneplain of the Trinity basin is from 500 to 1000 ft. lower than the bordering mountains, showing remnants of the Klamath peneplain. During a third cycle of erosion the streams deeply trenched the Sherwood peneplain and by widening their terraced cañons have reduced the plateau to a succession of ridges of approximately equal elevation. The relations of these physiographic features are illustrated in the accompanying generalized section from the South Fork mountains northeastward across the Trinity River basin to Thompson peak. The flat summit of the South Fork mountains and the gentle slope on the divide southwest of Thompson Peak belong to the Klamath peneplain (*a*). The flat-topped ridges (*b*) are remnants of the Sherwood peneplain. These remnants of the Sherwood peneplain are separated by terraced stream valleys (*c*) more than 2000 ft. deep.

GLACIATION

The uplift which closed the second cycle of erosion and initiated the third cycle was sufficiently great to form mountains and was soon followed by the development of glaciers which extended for comparatively short distances from the highest summits down the deepening valleys of the rejuvenated streams. There were many advances and retreats of the glacial ice throughout a long period and the glaciers were closely related to the development of the valley terraces during the third cycle of erosion when the modern streams were trenching their present valleys so deeply below the general level of the Sherwood peneplain.

Glaciers are gravel mills and the boulders and gravel of the till of the earlier glaciers, having thoroughly decomposed, liberated all the gold for concentration by stream action in the gravels capping the terraces of the present streams. Glaciers as agents of erosion forming the till and thus initiating the concentration of its gold in gravels have an economic aspect. The only auriferous gravels commingled with glacial deposits, or "dead wash," in the Trinity River basin, are on the larger streams heading in the higher portions of the Salmon mountains. The valleys of such streams as Coffee creek, Swift creek and Stewart Fork were occupied by glaciers of considerable size.

One of the most important conditions contributory to the formation of rich auriferous gravels is the deep weathering and disintegration of rocks that contain gold-bearing quartz veins. By this means the gold is liberated in the residual material and prepared for concentration by the streams in their gravel beds. That auriferous gravels commonly originate in connection with peneplains is evident in the Sierra Nevada, where the high gravels are associated with the low relief of a peneplain and contain a large amount of residual material resulting from the deep-rock weathering on the gentle slopes.



SKETCH MAP OF TRINITY RIVER BASIN, CALIFORNIA

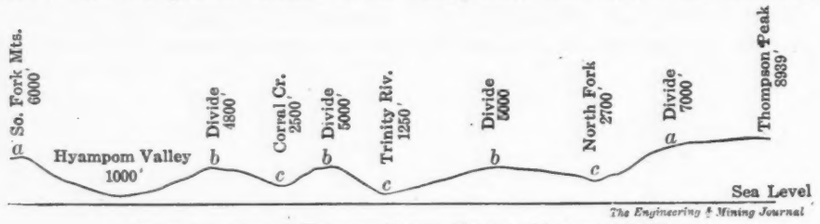
No auriferous gravels have yet been found in immediate connection with the Klamath peneplain on the borders of the Trinity River basin, but within the basin there are large masses of gravel whose origin may possibly be referred back to the Klamath peneplain.

Extensive deposits of auriferous gravel are associated in large part with the Sherwood peneplain, but their relations to it are such as to show that they are older

than the final stage of the peneplain and most probably originated in connection with an early stage in its development. The preservation of these ancient gravels is due to their having been faulted downward into basins where they were protected from erosion by the rim of harder rocks.

Weaverville Basin

The Weaverville basin attracted attention in the early '50's and ever since has been the scene of more or less vigorous activity in placer mining. The area is about 20 miles in length from the La Grange mine to a point near Swift creek and is one to three miles wide. Its surface is a well marked plain whose ends are of nearly equal altitude, approximately 3100 ft., but whose east side is 600 to 800 ft. lower than the west side, the plain sloping with the transverse drainage directly away from the Salmon mountains toward the present Trinity river. The greater thickness of the deposit in this area is probably not less than 1000 ft. and the general attitude of the strata is monoclinal, with a dip of about 26 deg. W., toward the fault which limits the deposit in that direction. This fault, first pointed out by D. F. McDonald, is illustrated by the accompanying section of the La Grange mine, where it lies between the auriferous gravels and Paleozoic black slates on the one hand and greenstones on the other. The La Grange mine exposes about 600 ft. of more or less distinctly stratified gravel which belongs chiefly to the upper portion of the Weaverville Basin deposits.



Section across Trinity River Basin (About 40 Miles)

The composition and general character of the deposits of the Weaverville basin are best revealed along the branches of Weaver creek in the vicinity of Weaverville, where hydraulic mining has been most extensive and is still in progress. The deposits as a whole are complex, consisting chiefly of an older succession of fine beds of residual material unconformably overlain by later gravels, some of which, at least, if not all, are undoubtedly due to the action of modern streams.

The relations of these gravels are illustrated in the accompanying section across the head of the Hupp mine as it appeared September 30, 1903. The soft rock, which is used in the Hupp mine as bedrock for hydraulicking the overlying gravels, is of special interest in that it is made up of residual products from the decomposed rocks of the developing Sherwood peneplain. In the inclined sand beds that form the false bedrock, as in the Hupp mine, small quantities of fine gold are widely distributed. In the gravels of the same beds toward the western edge of the basin, as at the La Grange mine, the gold content is sufficient to afford profitable mining when worked on a large scale. The gravels of the later stream beds, where the gold has been concentrated by stream action, have been successfully mined for many years, as in the Hupp mine. Within the Weaverville basin the La Grange and Hupp mines are the most important placer mines now operating. The day of small placer mining is past but there are yet at a number of places in the area large bodies of gravel that should yield a profitable return if worked economically on a large scale.

Dutton Creek and Browns Mountain Areas

An area of the old auriferous gravels comparable with those of the Weaverville basin is situated on Dutton creek, southwest of Weaverville, but it has not been definitely outlined. The gravels extend, but not continuously, for several miles from the head of Dutton creek, at an elevation of about 3550 ft. in the Sweepstake mine, down to the mouth of Dutton creek, at an elevation of 2200 ft. above the sea, or about 400 ft. above Trinity river, in the Dutton Creek mines.

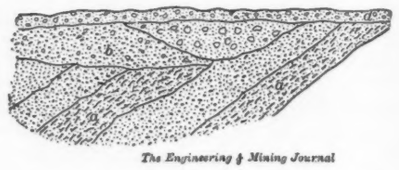
In the Sweepstake mine over 100 ft. of gravel is exposed. Some of it is fresh, but in the older portion, which is coarse, many of the pebbles are completely decomposed. At the Dutton Creek mines the gravel is coarser, with boulders 5 to 20 ft. in diameter. Some of the pebbles are decomposed and many of them incline toward the north, as if the stream came from that direction. The gravel extends over 600 ft. up the slope toward the Sweepstake mine and is limited on the west by a north-south rim rock that may be due to the faulting which preserved the gravels.

There are two areas of gravel about the summit of Browns mountain. These gravels have not been mined and their thickness where greatest does not exceed 500 ft. They border the summit of Browns mountain in such a way as to indicate that the mountain was an island in the broad stream that deposited the gravels.

Lowden and Redding Creek Areas

The Lowden area of ancient gravel extends about five miles down Trinity river from a point near the mouth of Rush creek. The gravel is partly cemented. The gravels at the Last Chance mine, situated southwest of Lowden, are in many places firmly cemented and require blasting in mining. The Last Chance mine is not now in operation. Its water goes to operate the Union Hill mine near Douglas City. The gravels of the Union Hill mine, which is now in operation, are uncemented.

The Redding Creek area lies seven miles southeast of Douglas City. It has a length of five miles and a width of about a mile. The beds strike approximately N. 45 deg. E., and the average dip is E. 27 deg. S., toward the limit which is supposed to be due to a fault. About 400 ft. of partly cemented gravel overlies 250 ft. or more of white tuff, in the upper part of which there is a 50-ft. bed of gravel. Below the tuffs are shales and thinner beds of tuff and a bed of shaly coal, ranging from five to 15 ft. in thickness. This body of auriferous gravel has a total thickness of approximately 900 feet.



Section across Head of Hupp Mine

(*a*) Soft bedrock; (*b*) sand and gravel (fine gold); (*c*) gravel (coarse gold); (*d*) latest stream gravel.

Panwauket and Redding creeks have cut terraced valleys across the tilted gravels and tuffs, and the terraces are capped by horizontal beds of gravel and sand to a thickness of generally more than 25 ft. These later bench gravels are due in large measure to the erosion of the older gravels and the concentration of their gold. The later gravels have been extensively mined, especially in Panwauket gulch and Indian creek, and it is estimated on good authority that they have yielded nearly a million dollars in gold.

Hay Fork Largest Area

The Hay Fork area is one of the largest in the region and extends throughout the Hay Fork valley, but the beds are generally concealed by a great expanse of alluvium of the local peneplain developed on the soft beds. Like the Weaverville, Lowden and Redding Creek basins, the Hay Fork basin is due to faulting. The total thickness of the tilted gravels and shales in the Hay Fork area must be over 1000 ft. They are unconformably overlain throughout the greater portion of the valley by alluvial gravels

from 5 to 12 ft. in thickness. These later gravels have been mined locally in a small way.

On Trinity river at Big Bar, sometimes called Cox's Bar, there is a small mass of soft shales, sandstones and some gravels with inclined stratification like the beds in the Weaverville basin. These, though sometimes mined, are generally used as bedrock for mining the bench gravels of Trinity river that cap the terrace.

The distribution of the gravels of the second cycle alines closely with the Trinity River basin. It appears that at one time the master stream of the basin flowed with exceedingly low grade by way of Hay Fork and Hyampom. The faulting that displaced and preserved the gravels finally led to the shifting of the main stream to its present course.

Active Mines in Second- and Third-Cycle Gravels

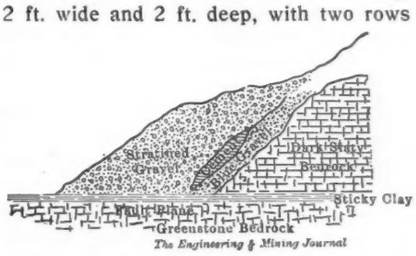
The fact that the La Grange mine is in the gravels of the second cycle is an indication of their economic value where they are in large bodies practically uncemented and advantageously situated. The Hupp mine, at Weaverville, is in gravel that is, for the most part, much younger than that of the La Grange mine, and represents a higher degree of concentration, but the conditions are not so favorable for handling large bodies of gravel as at the La Grange. As far as known, none of the gravel mines northeast of Weaverville are wholly in the gravels of the second cycle.

Gravels of the third cycle are confined to the cañons and narrow valleys of the present streams, and include not only the gravels capping the terraces on the valley slopes, but also those in the present stream beds. In general the gold should be most highly concentrated in the gravels of the third cycle. Furthermore, these gravels can be most easily and economically mined, because they are apparently uncemented and most readily reached by water for piping. These are the gravels so extensively mined in the early days. The most available and probably the richest have been washed away, but still there is much left that may pay well for economical mining on a large scale.

The benches mined by hydraulic methods generally lie between 25 and 400 ft. above the level of Trinity river. Many of these mines are still active during the spring. In 1908 there were in Trinity county 66 producing placers, of which 49 were hydraulic, three drift and 14 surface. A few of them are in operation during the summer. About Weaverville and Douglas City the only placers in operation in July, 1910, besides the La Grange and Hupp mines, already noted, were the Union Hill and Poker Bar.

The Union Hill mine is working gravels of the third cycle on a large terrace 175 ft. above Trinity river. The ditches, flumes, pipes and tunnels of this mine are said to be about 15 miles in length and carry sufficient water to run two 7-in. giants 23 out of 24 hours for nearly half the year under a head from the reservoir of 450 feet.

The Poker Bar Dredging Company began operations with a new plant in the summer of 1910 on a large bar only a few feet above the level of the adjacent Trinity river. The principal part of the plant is the stationary bucket dredge to raise the gravel 20 ft. The dredge pit is 20 ft. deep, reaching through the gravel 5 ft. into the bedrock. There are two centrifugal pumps which supply the nozzles with water, one from the river to wash the gravel into the pit from the elevator, the other from the pit to wash the gravel from the elevator down the flume. The plant was not quite complete in July, 1910. Seven men will be required in a shift, and it is expected that 500 cu.yd. of gravel will be handled by three shifts in 24 hours. The sluice is 100 ft. long, 2 ft. wide and 2 ft. deep, with two rows



Section at La Grange Mine Near Weaverville

of wooden blocks. A small dynamo supplies the electricity for lifting the plant.

Outlook Promising

It is probable that with a strong water supply under pressures having a head, as at the La Grange mine, of 450 to 650 ft., much of the gravel of the second cycle that is favorably situated could be successfully mined. Some of this would probably require blasting. At the La Grange, however, by undercutting, the cemented portion is crushed by the superincumbent load. At this mine the gravels are most favorably exposed, but farther northeast, along the faulted border of the Weaverville basin, these gravels have been in large part washed away by the mountain streams, or covered up by the overlapping "dead wash" from the Salmon mountains.

It is probable, however, that there are large areas, including the Browns Mountain areas, which with the fine water supply available could be worked to advantage. Browns creek, Redding creek, Indian creek, Grass Valley creek, each carries a considerable though not large water supply that might be turned in upon the gravels of the Redding Creek basin, where the conditions are favorable for mining.

In general, the gravels of the second cycle where too firmly cemented for hydraulicking, are not sufficiently rich to warrant crushing. They should, however, be carefully prospected, for it is possible that some parts rich enough may be found. This, perhaps, is less probable if we consider the mode of origin. These gravels are of fluviatile origin, but gravels sufficiently rich to crush, as shown by G. F. Becker, are generally of marine origin.

The gravels of the third cycle are more widely distributed, but of less volume than those of the second cycle, and as they present less formidable obstacles to mining, they are receiving more attention. Most of the country is timbered, and dumping facilities are generally ample and not so restricted by the anti-débris laws, as in the Sierra Nevada. With a fine water supply from the higher mountains conditions are favorable for mining.

In general, the gravels have been richest on streams heading in the Salmon, Trinity and Bully Choop mountains and decrease somewhat in value as the distance from the source increases. The large gold content of the Coffee Creek region is well known, and it is believed that the extensive bodies of gravel on the bars and benches of the upper part of Trinity river are well worthy of investigation. If the dredges already started at Trinity Center and Poker Bar prove as successful as they promise to be, a new impetus will be given placer mining.

Quicksilver in United States in 1910

Of the 19 mines producing quicksilver in the United States in 1910, 15 are situated in California, two in Nevada, and two in Texas, according to H. D. McCaskey, of the U. S. Geological Survey. The production in 1910, as obtained from confidential returns to the Geological Survey by every producer in the country, was 20,601 flasks of 75 lb. each. At the average domestic price at San Francisco, $46.51 per flask, the value was $958,153. As compared with the production of 1909 this shows a decrease in quantity of 474 flasks but an increase in value of $294.

Although the production of California increased in 1910, the output from Oregon decreased to nothing, as that of Arizona did in 1909, the small Nevada production fell off greatly, and the output from Texas decreased. In no State, except possibly in Nevada, can an increased output be expected for 1911, the present outlook being for a total production for the United States not exceeding 20,000 flasks.

Palladium is a malleable white metal of specific gravity of about 11.97, and the lowest melting point of any of the platinum group, i.e., about 1549 deg. C. Its most extensive use is in dental alloys.

Prospecting for Brown Iron Ore

By H. S. Geismer *

Deposits of brown-iron ore are typically erratic and demand careful and systematic prospecting, for which a portable churn drill is the most suitable means.

*Keiser-Geismer Engineering Company, Brown Marx building, Birmingham, Ala.

Prospecting on brown-iron ore properties, if properly carried out, should enable one to determine three things: (1) The quality of the ore that may be recovered; (2) the practicability of finding suitable locations for the required washeries, mud dams, transportation facilities, water supply, etc.; (3) the extent of the deposit, the number of acres that should be considered mineral bearing and the approximate tonnage contained. Until all of these data have been completely determined and the results properly considered, no one should feel justified in investing money to develop such properties. That this remark is not superfluous will be evident to anyone who examines the abandoned brown-ore plants scattered along the Appalachian valley from Pennsylvania to Alabama. The causes leading to abandonment of these plants are various, but in nearly every instance sufficient prospecting in the beginning would have foretold such failures, unless (and such instances are not uncommon) present competent prospecting should reveal large orebodies of sufficient importance to make the plant a success.

Quality of the Ore

Since an iron ore, to have commercial value, must analyze within certain limits, depending upon the kind of iron to be produced, the first step should be to obtain samples of the ore for analysis. Brown-ore deposits sometimes show wide variations in analyses within short distances and at different depths, so it would seem the part of prudence to obtain as many samples from as widely separated parts of the property as possible. This should not be taken to mean that extensive prospect pits and drill holes should be put down at once, but a few scattered pits, and possibly a drill hole or two if the deposit lies deep, should certainly be required.

In obtaining these samples, a good plan is first to make a careful inspection of the ore face to see if any variations in the quality at different elevations or on different parts of the property are noticeable, and also to observe what impurities are visible. Most impurities, such as phosphorus, sulphur and silica, affect the appearance of the ore to a marked degree, and their presence is easily detected by an experienced observer. Such an inspection will often reveal an occasional boulder of pyrite entirely surrounded by a thin coating of high-grade brown ore, and it then becomes important to determine just what percentage of the samples should consist of such boulders. Again, it may show that a thin deposit of low-phosphorus gravel ore in Tertiary loam caps a deposit of high-prosphorus ore embedded in residual Cretaceous clay, and it becomes necessary to approximate the relative thickness of the two kinds of ore if it appears that the entire deposit will have to be mined without attempting a separation. Or again, the exposed face may reveal a capping of highly silicious ore overlying a low-silica deposit and their relative thicknesses will be required. In passing below the water level of nearby streams, a considerable variation in analyses of the ore is often encountered; this is especially noticeable in the sulphur content of ores derived originally from iron pyrites, and such deposits may become worthless on account of excessive sulphur after passing a few feet below such water level.

Interpretation of Analyses

After obtaining satisfactory samples, they should be turned over to a competent chemist for analysis, and all work stopped until the results are received. If possible, the chemist should be one who is familiar with blast-furnace practice in the district where the ore is to be consumed, as he knows exactly what is required and will not waste time on unnecessary determinations. If either the sulphur, phosphorus or insoluble content in all of the samples proves too high, there is no use to proceed further. If, however, some of the samples indicate a suitable product, it may be advisable to investigate the feasibility of separating the good from the bad, or, better still, of making a mixture of the different kinds in such proportions that the resulting product would be satisfactory. As soon as the chemist decides that the quality of the free ore in the samples is of suitable analysis, experiments should be made to determine the possibility of separating at a reasonable cost the free ore from the materials in which it is found associated, and with which it is generally intimately mixed. Often an experienced observer can obtain samples from the pits that will correspond closely to the commercial product that a deposit will yield after being treated in a washer, but if there is any doubt as to the accuracy with which such samples can be obtained, actual washing tests should be conducted.

Stiff clays and small pieces of porous rock offer the greatest obstacles to successful separation: The first form clay balls that cannot be separated unless the output of the washer is cut down below a profitable point for operation, while the latter resist all efforts at separation by washers and yield only a poor product when treated by jigs because their specific gravity is so close to that of ore. Another impurity that is separated from brown ore with great difficulty is "galvanized rock," so called from the fact that its surface has apparently been coated with a thin metallic film. It resembles ore so closely that it cannot be discarded by hand sorting on picking belts, and is often too porous to be separated by jigging.

It was not my intention here to discuss methods for treating brown ores, but I wish to bring out the fact that the quality of the final product to be derived from any deposit may hinge on many factors, and that unless a prospector is familiar with all the methods that might be employed to improve the quality of such an ore, his report should not be taken as final.

Sites for Washeries, Etc.

The sites for washeries are limited entirely by topographical features, and for making the required investigations to obtain such data, the services of an engineer experienced in brown-ore plants should be obtained. Such investigations present no special difficulties, and so will not be discussed at length, but a few comments on details sometimes overlooked may prove helpful.

In considering the possible sources of water, one should not lose sight of the fact that many streams are only "wet weather branches" and dry up during the summer months. This is especially true in the southern Appalachian field. The dry months being the ones when opencut mining is carried on to best advantage, such streams should not be depended upon for water supply unless opportunity occurs to impound enough water to last through the dry months.

In choosing a washery site, it is not advisable to consider all adjacent farm land as available for future settling-pond requirements. Farmers sometimes manifest great partiality to certain portions of their lands that happen to border brown-ore properties, and if they refuse to sell when the operator finds that he is compelled to buy, it is quite possible that the settling ponds may come high. Brown-ore dirt usually yields about one ton of ore to six yards of material put into the washery, so the latter should be close to the ore deposit or the haul will make

the cost prohibitive; two miles is considered the limit for haul in most districts, and except for rich deposits one mile should not be exceeded.

It is also advisable to inquire carefully into the State laws regulating the diverting of small streams, as well as those that deal with the pollution of streams by mud and other waste material.

Area of Deposit

The extent of the deposit is by far the most important factor, and yet in many instances large plants have been erected without attempting to estimate the quantity of the ore that they might be expected to handle; as a consequence, instances are not uncommon where the total value of the ore produced by a plant has not equaled in value the actual cost of erecting the plant.

To estimate the tonnage of ore contained in any deposit, the following data are required: (1) Area of the deposit; (2) thickness and richness of deposit.

If the ore deposit is exposed over its entire extent, i.e., is not covered with an overburden of barren material, its area is easily obtained, but care must be taken to deduct from the area classed as ore bearing all barren areas lying within such deposits. If the deposit is not exposed, holes must be put down through the overburden to locate it. When holes are sunk for this purpose they are not discontinued when the surface of the ore is reached, but are continued through the deposit to determine its thickness.

As soon as the survey to determine the area of a deposit is completed, it should be plotted on a map to a scale of not less than 100 ft. to the inch, and after the estimate is made the map should be carefully preserved and any information afterward obtained should be promptly added to it. If it becomes necessary to drill the property, the holes should be first determined on the map and then staked out on ground to correspond. As fast as the holes are completed their depth (depth of ore and depth of overburden) and the analyses of ore encountered in each 10 ft. of advance are recorded on the map near them. On such a map should also be shown the elevation of the water level of nearby streams with reference to the test holes; this is important, as in most regions it is not possible to mine brown ore lying below water level at a satisfactory cost. In some places the quality of the ore changes rapidly as water level is passed and the ore would not be suitable for commercial use even though it could be mined at a reasonable cost. The usefulness of such a map is not ended when the tonnage estimate is completed, for it will be of great advantage to the future operating official in estimating the quantity of stripping that he is to handle and the cost and methods to be employed.

Thickness and Richness of a Deposit

This information is obtained by means of wells or drill holes which are driven through the deposit to permit actual measurements to be taken and also allow samples to be obtained from which the quantity of clean ore per cubic foot of deposit can be estimated. The samples required for this information should be analyzed to check the determinations for quality made during the preliminary prospecting of the property.

There are several methods for sinking holes to obtain such information, each of which has particular adaptabilities to certain types of deposits; suggestions as to the special application of these different methods to the various types of deposits will be reserved for the paragraphs in which the types of deposits are discussed. The two methods most frequently employed are sinking wells by hand, and boring holes with churn drills.

Sinking Wells by Hand

A windlass, rope, bucket and short-handled pick are used. Such holes, of about 30 in. diameter, can be sunk economically to depths not to exceed 50 ft., providing but little solid rock is encountered. When rock is encountered, blasting has to be resorted to, and their small diameter does not permit a steel and hammer to be used expeditiously; if their diameter is increased, they become too costly and require too much time for completion. In ordinary blanket material two men will sink about 10 ft. per day. When completed, the prospector descends in a bucket to measure their depths, to obtain samples of the material penetrated at different depths, and to make a general examination of the nature of the deposit.

Boring with Churn Drills

In churn drilling, the property is covered with holes of about 6 in. diameter, to any required depths up to 500 or 600 ft. The holes are drilled rapidly, a good crew averaging about 50 ft. per shift when in loose material, and 30 ft. in rock, and the cost is less than by any other method. Any of the light types of standard churn drills are suitable, and either steam or gasolene power may be used. If the country is rather hilly, and water has to be hauled from a distance, the gasolene machine is to be preferred, as it is lighter and requires no water for boiler use; two or three barrels of water per shift will furnish such a machine with all that is required for cooling the engine, following the bit, and floating the drillings for the sand pump.

For general prospecting I prefer a light, nontraction, gasolene-driven machine, weighing about 6000 lb., exclusive of the gasolene engine. The holes required for brown-ore prospecting rarely exceed 150 ft. depth and, as a rule, do not require casing, so that the lightest machine will stand up to the work. Unless the ground is level, the traction feature is of little advantage. For such machines, a 6-h.p. engine is ample. In purchasing such machines, it is advisable to get extra bits, as broken and loose bits often delay the work for days when no extra ones are at hand.

Precautions in Churn Drilling

In using churn drills, two precautions must be insisted on continually, or the results will be useless if not misleading. (1) Bail the hole out clean with the sand pump every time the drill advances 3 ft. (2) Carefully examine the washings recovered by the sand pump for quantity and quality of ore contained.

If a bit is penetrating clay strata and suddenly encounters an ore boulder, the first result will be to force the boulder down into the soft clay that underlies it; gradually as this clay becomes more and more compact the boulder will begin to crack, and finally the bit will force its way completely through it. Unless, therefore, the hole is carefully bailed out at frequent intervals, the sample recovered at any particular depth may not represent the material being penetrated at that time, and it might be possible to recover ore in the sand pump for some time after the actual ore deposit had been completely penetrated. Careful bailing of the hole after each 3 ft. of drill advance will eliminate this chance of error and give accurate results.

In instructing drill operators for this class of work, it is advisable to follow down the first few holes with wells, so that the driller may examine the strata foot by foot, and see exactly how they compare with what the drill led him to believe would be found. Similar test wells are also to be advised whenever the nature of the deposit changes considerably.

Examination of the Borings

The quantity and quality of the ore encountered by the drill, and the thickness of the ore deposit are determined as follows: Each time the bit advances 3 ft. the hole is bailed out with the sand pump, and from the washings recovered by the pump a pailful is saved. This pailful is carefully sifted until all of the mud is separated from the rock (ore, etc.), and the rock material is then put into bags and sent to the laboratory to be analyzed. From these samples one can obtain a general idea of the quality of the ore that may be recovered from the deposit, provided certain allowances are made: If the washings contain much clay, the sample will be better than the ore mined, because no washer will make a complete separation of clay and ore;

if the washings show considerable worthless rock or sand mixed with the ore, the sample will not be so good as the final product, because by means of jigs and picking belts the larger part of the rock and sand can be separated. Just how accurately the observer can allow for these characteristics will depend upon his experience.

As soon as the samples indicate that the lower limit of the ore has been reached, drilling is stopped and the exact depth of the hole is measured and recorded.

The relative quantity of ore per foot of depth is estimated by the amount of ore recovered from the bucketful of washings, and by occasional test wells following the drill holes. Such results may appear manifestly inaccurate to one who has never had experience with such prospecting, but an experienced observer will obtain results that are as accurate as any of the factors that enter into an estimate of brown-ore tonnage.

Types of Brown-ore Deposits

Geological discussions dealing with the classification and origin of different types of brown-ore deposits are confusing to the average prospector, but it is possible to group all of the different types of deposits into four classes that are easily recognized by any prospector, and such grouping need not tax one's ability as a geologist: (a) Float deposits; (b) gravel deposits; (c) boulder deposits; (d) bedded deposits.

Float deposits consist of rounded boulders of brown ore, scattered over the surface of barren areas, associated with other boulders of all sizes and descriptions. They have no value except in rare instances, when the ore boulders are numerous enough to justify hand sorting and loading. They do not justify prospecting unless associated with ore-bearing soils, in which case they are properly grouped with gravel or boulder deposits.

Gravel deposits are made up of small, irregular pieces of ore, ranging in size from shot to cobblestones, associated generally with reddish loam and gravel of Tertiary age. The deposits are usually shallow, rarely exceeding 15 ft. depth, and this depth is fairly uniform over considerable areas; as a rule, there is no overburden on the ore that requires to be stripped off, so the extent of the deposit is easily determined by the aid of test wells.

Gravel deposits sometimes overlie boulder deposits, but this is not usually the case. When so formed the two classes of deposits are generally separated by a thin layer of pebbles lying unconformably over the lower one. It is advisable to put down several drill holes before concluding definitely that any gravel deposit is not underlain by a deeper deposit; until such holes are put down, however, the tendency will be to overestimate the importance of a gravel deposit, as it so often occurs as a thin blanket completely covering and concealing large hills of worthless rock.

Boulder deposits consist of irregular masses and fragments of ore ranging in size from shot to boulders of several tons weight, associated with clay, loam, and gravel, lumps about 1 ft. in diameter usually predominating. These deposits generally rest on an uneven bed of limestone or residual clay derived from limestone; this bed, being so irregular, is found at times projecting up through the entire thickness of the deposit, in the form of reefs or horses, and may entirely cut out the ore-bearing material over considerable areas. The surface of such deposits is also irregular, and at times is completely covered with an overburden varying from a few feet to 100 ft. or more in depth. Boulder deposits may cover large areas and reach to considerable depths, but, when so found, are liable to contain numerous areas of barren material which can be located only by extensive prospecting.

Test wells may be used to advantage in prospecting boulder deposits that come to the surface and are not over 60 ft. in depth, but as a rule, a considerable overburden is encountered and churn drills should be employed. In prospecting boulder deposits, a great deal of experience is required to distinguish between the Cretaceous clays which are associated with and contain the ore boulders, and those clays which underlie the ore-bearing strata. Such experience will often enable one to save half the drilling cost.

Types of Bedded Deposits

Bedded deposits include all those that rest on a regular, well defined foot wall, whether they be of residual concentration, or of replacement origin. They permit further subdivision into *vein deposits, fault deposits* and *boulder deposits.*

Vein deposits, although occurring between well defined foot and hanging walls, are not original stratified bodies, but are apt to present all of the irregularities in thickness and richness characteristic of other types of brown-ore deposits; they are generally of replacement origin.

Fault deposits are generally recognizable by the large volume of brecciated rock cemented within the ore mass, or by their proximity to well defined surface faults; these surface faults furnish an easily followed guide for the prospector. The contents may be of residual concentration, or of replacement origin.

Boulder deposits of the bedded variety differ from those of similar name described above in that they rest on a well defined foot wall, and, although the foot walls are often folded and broken, they furnish no projections into the mass of the orebody corresponding to the limestone reefs and clay horses above referred to.

The bedded deposits, considered as a class, are the most satisfactory to prospect, inasmuch as the foot walls present a well defined and easily recognized limit beyond which the prospector need not penetrate; but great variations in thickness and inclination are characteristic of them, and failures traceable to insufficient prospecting are as common in regions in which such deposits predominate as in any of the others.

For determining the depths of bedded deposits, all of the methods of sinking holes are applicable at times. For penetrating the boulder and fault varieties, wells or churn drills may be employed, the choice depending upon the thickness of the overburden and the extent of the deposit, just as was the case with the boulder deposits previously discussed. In some localities the ore of this type occurs in a massive formation overlain by rock capping of uneven thickness; when so found the results obtained with a core drill are the most satisfactory.

Vein deposits are also well adapted to penetration by core drills, although, as a rule, their hanging walls are thin and offer no difficulties to drilling with churn drills. Often the original hanging wall has been replaced by an uneven, variable overburden, in which case wells may be used to advantage, especially if the vein proper is thin and lies close to the surface.

Conclusions

In closing this paper I wish to emphasize two things: (1) As brown ore does not lie in stratified beds, no estimate should be attempted without thorough prospecting. A few scattered masses of ore exposed at intervals of a quarter of a mile or so may inspire confidence, but they are generally misleading; nor should long discussions of regional geology and probable sources of brown-ore deposits be considered as anything more than interesting literature, unless accompanied by systematic records of prospecting actually carried out.

(2) The churn drill offers a quick, cheap and reasonably accurate method of testing most deposits, provided it is carefully handled by an experienced operator. Its general adoption by all brown-ore operators would practically eliminate the present uncertainties so characteristic of many such operations.

The first consignment of ferronickel made in New Caledonia has been received in France. It was made by the Société de Tao in the electric furnace. The alloy contains about 60 per cent. iron and 40 per cent. nickel, with 1 per cent. carbon and a trace of silicon, but no sulphur nor phosphorus.

Modern Mine Power Plant—I

By Guy C. Stoltz *
and Samuel Shapira †

The new Witherbee-Sherman power plant at Port Henry, N. Y., consists of water-tube boilers provided with superheaters, four-stage turbines, and alternating-current generators of 2300 kw. combined capacity.

*Chief engineer, Witherbee, Sherman & Co., Mineville, N. Y.

†Mining engineer, Witherbee, Sherman & Co., Mineville, N. Y.

Witherbee, Sherman & Co., operating magnetite mines at Mineville, N. Y., are equipped to produce over 1,000,000 tons of high-grade ore annually. A small percentage of the output is shipped without milling, averaging about 60 per cent. iron and 1.3 per cent. phosphorus, while a greater proportion of the ore hoisted is concentrated electromagnetically, the iron content being raised to 65 per cent. and the phosphorus reduced to 0.75 per cent. Special high-grade concentrates can, if required, be milled to 71 per cent. iron and 0.17 per cent. phosphorus.

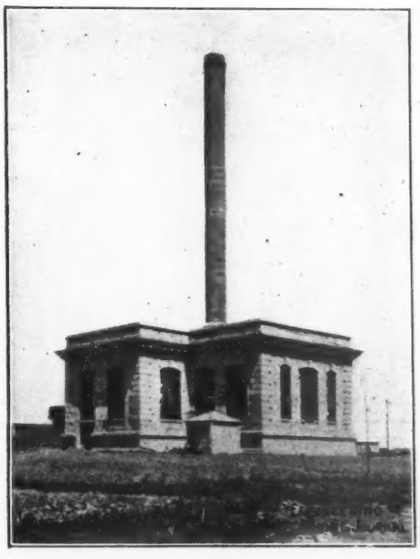
To operate economically the several mines, each so located that individual hoists, compressors and concentrating plants are necessary, it was deemed expedient to install new power plants, and electrify the entire surface and underground equipment. With entire electrification in view, the company has built a two-unit turbo-generator plant, 800 and 1500 kw. respectively, at Port Henry, N. Y., six miles from the mines, and have further installed at a corliss engine, 750-kw., generator plant at Mineville, a 750-kw., low-pressure, turbo-generator set. Two hydroelectric plants at Wadhams Mills and Kingdom can be counted upon, during a greater part of the year, for a 675-kw. combined load.

The Port Henry plant embodies the latest practice in a strictly steam-turbine plant, operating condensing and using superheated steam. The power equipment is noteworthy because of its magnitude and its thoroughly modern design. The electrical installation at all plants was furnished by the General Electric Company, and was under the direction of H. Comstock, assistant general manager, and H. F. Pigg, electrical engineer.

The building, roughly T-shaped, of concrete and steel construction, was designed by H. C. Pelton, of New York. The floor space, 7500 sq.ft., includes 530 sq.ft. of mezzanine floors. Two-thirds of the area is occupied by the boilers and the remainder by turbines and auxiliaries. The walls are 49 ft. high to the coping, and are windowed to give a generous supply of natural light. The cubic contents of the building are 373,173 cu.ft., and it was erected at a cost of approximately $87,500, or 23½c. per cubic foot.

Handling of Coal

No. 2 buckwheat anthracite coal is used as fuel, of which 11 tons, with proper draft and fired on suitable grates, will equal the steaming value of 10 tons of bituminous. The total cost of a ton of this fuel delivered to the plant is $2.65 (which includes 15c. per ton for unloading) while the cost for bituminous is $3.92 per ton. The coal gondolas from the Delaware & Hudson main line are pushed up an eighth-mile spur and dumped between the concrete bents of a trestle 100 ft. long, on the north side of the building and 25 ft. distant from the front of the boilers. At present no mechanical handling system for the fuel has been installed; several methods, however, are being considered. All coal is now being handled in wheelbarrows of 400 lb. capacity, which pass over scales to the boilers. Weighing is necessary in order to determine the daily fuel cost per kilowatt-hour, so that an intelligent charge may be made at the station for power distributed from this plant.



Port Henry, N. Y., Power Plant

The Stack

Natural and forced draft are required. The former is obtained by a circular, reinforced, monolithic, concrete stack. The stack is situated centrally between the line of boiler sets, stands 175 ft. high, and has an internal diameter of 8 ft. A 4-in. air space is provided in the lower 47 ft. of the stack, the outside wall being 7 in. thick and reinforced longitudinally with 1¼x1¼x 3/16-in. T-bars; the inside wall is 4 in. thick and provided with the same reinforcement, 16 lengths in all being used, while the horizontal ⅝-in., round, iron bars are spaced on 18-in. centers. The outside shell is reinforced with 80 vertical bars, the number diminishing to 32 in the interval of 65 to 85 ft. above the surface. The upper 90 ft., which is a single shell 5 in. thick, has 16 vertical bars, together with the ⅝-in. iron bars on 18-in. centers, equivalent to a reinforcement of 0.46 per cent. Around the 3x8-ft. breeching entrance, and for a hight of 12 ft., the stack is lined with firebrick.

Boiler Room

The boiler room, occupying by far the greater part of the building, is 105 ft. long by 48 ft. wide by 49 ft. high. The floor is of concrete and slopes from the side walls to the pipe trenches.

The equipment consists of six sets of Babcock & Wilcox water-tube boilers with a combined capacity of 1864 h.p. Four sets of boilers are rated at 266 h.p. each and the other two sets at 400 h.p. each, all being equipped with superheaters. The floor space occupied by this installation is 1745 sq.ft., or 35 per cent. of the total boiler-room area. All the boilers are provided with No. 3 McClave grates, having 3/32-in. mesh openings. The grates are especially adapted to burn the smaller sizes of anthracite, and are so made that each row of grate bars is divided into a front and rear series by means of two separate connecting bars, operated by twin stub levers and connecting rods, with an operating handle adapted to grasp either one or both of the levers in such a manner that the front and rear series may be operated separately or together. In the shaking movement of the grates there is no increase in the size of openings. The grates have an area of 65 sq.ft., and a slope of ½ in. per foot.

Blowers

Each boiler is equipped with Wing turbine blowers to provide forced draft. The 400-h.p. boilers are provided with two 20-in. blowers, while each of the 266-h.p. boilers has a 20-in. blower. The Wing blower is a combination of a disk fan and a simple turbine. The turbine consists of a series of buckets fastened to the outer ends of the blower blades to receive the impulse of steam; they are especially designed to utilize the highest

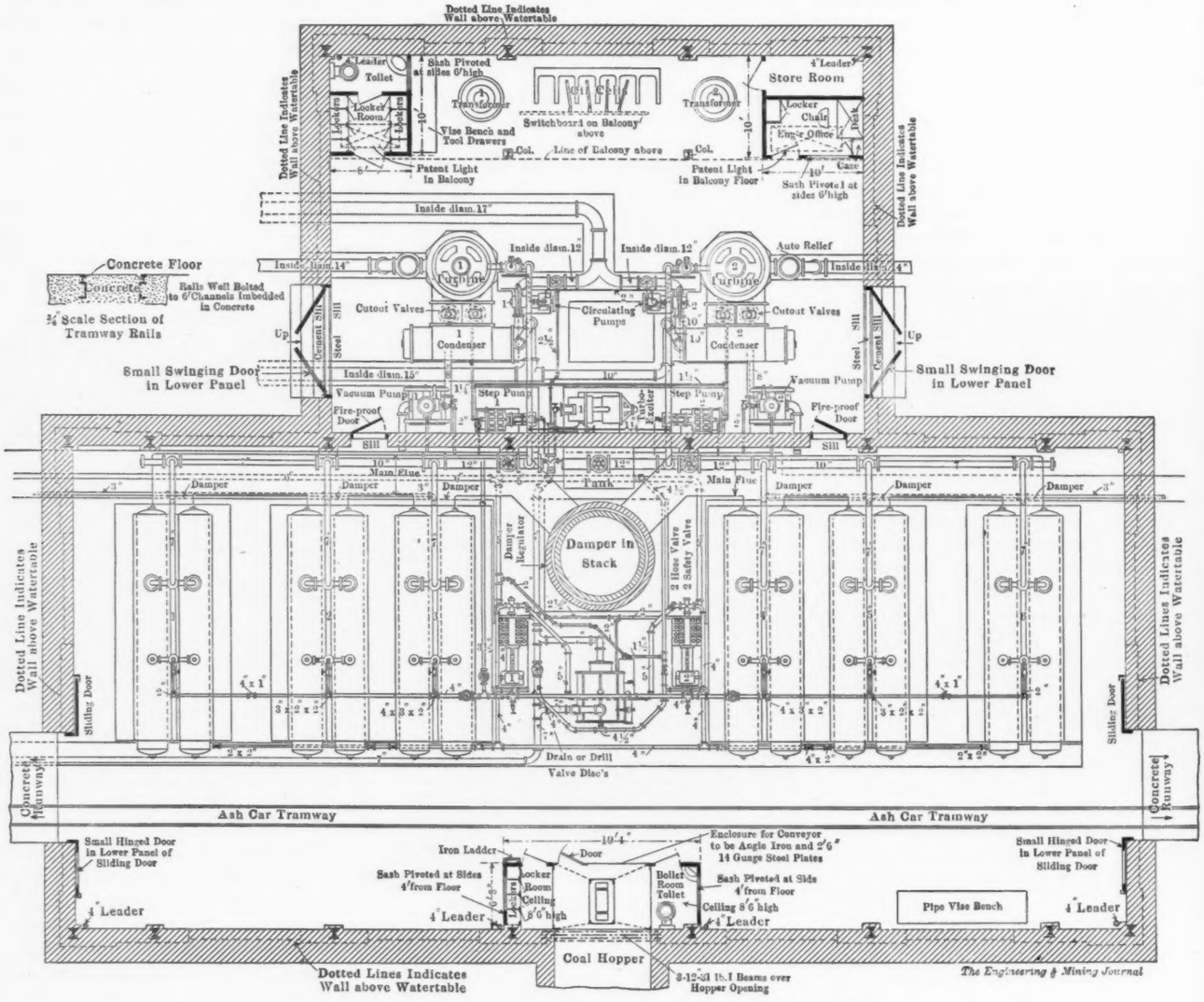
expansive value of the steam, which issues from three or more nozzles. For forced draft the small amount of steam that drives the blower, about 2 per cent., passes in under the grate with the air, thoroughly mixed, and helps to soften any clinkers which may form on the grates. With the aid of the blowers, 25 per cent. increase in boiler capacity is obtained, while using any fair grade of fuel. Being operated by a balanced valve, through a damper regulator, the blower is in operation only on a fall of steam pressure, thus keeping the pressure constant within a few pounds. The blower is installed in the side wall of the boiler, and thus requires no floor space or attention, aside from oiling.

Regulators

A Davis damper regulator is used in connection with the Wing blowers. This regulator is operated entirely by steam taken direct from the boiler. The operating piston is attached to the damper lever by a chain, and is controlled by a pilot valve which has ports for the admission and exhaust of steam. The pilot-valve piston has full boiler pressure beneath it at all times, which is balanced by weights on the top of it. The amount of the weight is just sufficient to balance the pressures at which it is desired to close the damper. In a normal position the damper is held open by the counterweight at the end of the lever arm, the operating piston is at the upper end of its stroke, and the pilot-valve piston is at the downward end of its stroke, with the exhaust port of the operating cylinder open. In this position, there is a maximum draft on the boiler, tending to increase the pressure. When the pressure acting under the pilot-valve piston becomes great enough to overbalance the weight holding it down, it will move upward, close the exhaust port from the operating cylinder, open the inlet port and admit steam which will force the operating piston down, and close the damper. In this position all the draft is shut off, tending to decrease the pressure in the boiler. The action is entirely automatic and is repeated as often as the boiler pressure varies enough to allow the regulator to operate. All the blowers and main dampers of the smoke breeching are connected to this automatic regulator, which is guaranteed to maintain a pressure within 2 lb. of a fixed amount, 160 lb. in this case.

Pumps

Two main pumps, 10x6x10 Knowles, and one large Knowles 16x5x12 compound, duplex, pot-valve pump are used to supply the necessary water to the boilers. Under ordinary working conditions, the two smaller pumps are sufficient, the larger pump being held in reserve. The water comes from the condensers in the turbine room to a large tank, 20 ft. diameter and 18 ft. high, open at the top, which serves as a storage tank and allows an escape of the air which comes with the condensed water. The tank is located directly in front of the stack in the boiler room and is supported on steel legs resting on a reinforced-concrete platform 10½ ft. above the boiler-room floor. The water from this tank

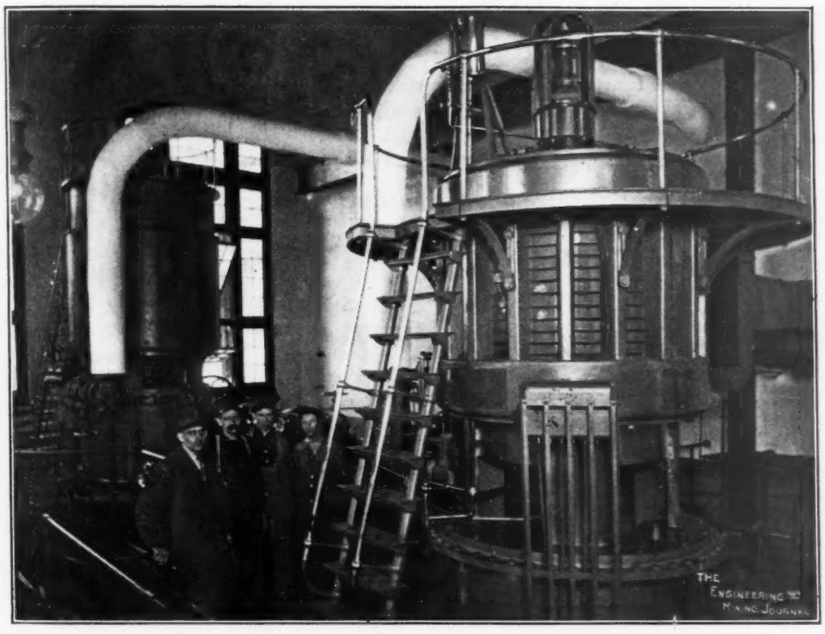


Layout of the Witherbee-Sherman Power Plant

is divided to flow to two Cochrane 1000-h.p. feed-water heaters, each having a 5-in. suction outlet, a 10-in. exhaust outlet, a 10-inch exhaust inlet and a 3½-in. waste pipe, which also rests on the above mentioned platform. The Cochrane heaters receive exhaust steam from all the auxiliary pumps to heat the feed water. The remainder of the feed water is supplied by two small Knowles pumps. All pumps are tied into the same supply system, and a 4-in. pipe line is used for boiler feed.

Piping

Superheated steam from each of the boilers is taken through a 7-in., extra-heavy pipe, inverted U-shaped, with 12-ft. spread, and delivered to a 10-in. extra-heavy collecting header placed in the rear of the boilers and extending the entire length of the room. From this main header, two 7-in. extra-heavy inverted-U pipes take the superheated steam to the turbine.



Turbines at the Witherbee-Sherman Plant

This header is equipped with five 10-in., extra-heavy bypass gate valves, so placed that the steam may be taken from any set of boilers or all, according to the need of the plant. Running parallel with the main superheated-steam header is a 2½-in. auxiliary saturated steam header, from which proper leads are taken to the auxiliaries. Extra-heavy piping and fittings are used on all the superheated lines, and heavy piping and fittings on all other steam lines. The superheated-steam pipes are covered with 85 per cent. magnesia blocks 1 in. thick and 3 in. wide, and with double standard thickness sectional covering; the outer layer is of asbestos sponge felt, and the total thickness of covering is 3½ in. The covering for the other steam pipes is sectional asbestos fire felt, of standard thickness.

Smoke

The 4x9-ft. smoke breeching is made up of No. 10 gage iron plate, laid on a framework of 2x2x1¼-in. angles. It is supported by iron brackets from the partition wall, and is furnished with two main dampers, one on each side of the stack and near the stack openings. These dampers are so hung on ball bearings that there is the smallest amount of friction, and they are free to open and close when worked by the Davis regulator to which, by means of suitable cords and pulleys, the damper arms are attached. Besides these two main dampers, each boiler is provided with hand-operated dampers placed at the boiler-flue openings and breeching connections.

At present, ashes are handled with wheelbarrows and, before dumping, they are weighed. A McClave-Brooks ash-conveyer system is to be installed, and this, with the proposed coal-handling system, will make the boiler room uptodate in every respect.

Turbines and Auxiliaries

The turbine room, 38x52 ft., contains two Curtis four-stage turbo-generators, one of 800 kw. running at 1500 r.p.m. at 6600 volts, and a second of 150 kw. and the same speed and voltage. Both run on oil-step bearings and are controlled by hydraulically operated governors. The turbines are placed on solid blocks of concrete standing 7 ft. and 9 ft., respectively, above the main-floor level. Stairs lead to an iron-grate walkway which surrounds both turbines and extends to the north partition wall where are situated the oil pumps, separators, and other auxiliaries. A full-load water rate of 18 lb. per kilowatt-hour is guaranteed on the larger unit and a rate of 18.2 lb. is given for the smaller turbine, running condensing. Steam at 160 lb. pressure and superheated 100 deg. is delivered to the turbines, while all of the auxiliaries operate on saturated steam.

Excitation for the turbo-generators is furnished by a 35-kw. induction motor-generator set, and by a 25-kw. horizontal single-stage turbo-generator; either set has ample capacity to supply excitation for both generators.

The condensing apparatus for the turbines is of the surface type, and consists of two circulating pumps and two air pumps supplied by the Wheeler Condenser Engineering Company. A vacuum of 28 in. is maintained. The centrifugal circulating pumps are direct connected to vertical high-speed engines. The air pumps are of the Edwards vertical type, 8x20x12 in., and deliver the condensed steam to a standpipe and finally to Cochrane heaters of the open type, as previously described.

The oil from the step bearings runs to a collecting tank of 100 gal. capacity, from which it is delivered by a Knowles pump to a Niles filter of 600 gal. capacity, where oil and water separation is effected. If necessary, the oil can be heated to lessen its density before filtering. The filtered oil is then delivered to one of two step pumps; both are Dean Brothers, 4x2½x6-in., outside-packed, plunger type, and operate at 350 lb. and 425 lb. pressure, respectively. The oil from the tank is delivered to an overhead reservoir at 130 lb. pressure by two Blake 3x4-in. duplex oil pumps, piston type. From the receiver, the oil flows to the hydraulic governor and to the top and middle bearings of the main turbines through bafflers.

The larger turbine is cooled by forced ventilation, effected by a disk fan which is mounted on the main shaft. The stator and rotor on the smaller unit are cooled by a fan circulation piped to the generator.

A 20-kw. horizontal single-stage turbo-generator set provides for lighting the building and yards. A mezzanine floor, 9 ft. above the main floor, is built against the south wall of the room, to receive the switchboard. One of the switchboard panels is for the exciter, one for the regulator, two for the generators and two for the lines. The cells for oil switches, transformers for motor-generator sets, exciters and all high-potential wiring, are located under the switchboard floor. All piping, where possible, is distributed to the units through concrete trenches in the floor, the trenches being covered with removable cast-iron plates. One 30-ton Brownhoist crane is installed in the turbine room. The entire equipment in this room can be operated by one engineer and one oiler for each shift. The entire cost of equip-

ment at the plant was approximately $160,000 installed.

Power Transmission

Three-phase current at 6600 volts is sent from the plant over a double transmission line, two sets of three wires each No. 000 and No. 00 B. & S. gage. The lines are strung on wooden poles fitted with standard cross arms, provided with locust pins and porcelain insulators. All highway crossings are protected by safety aprons strung from pole to pole. Leaving the main building, the transmission lines run through a small building of monolithic concrete which contains lightning arresters of the shunted multi-gap type.

Transforming Station

At Mineville, before entering the transformer station, the high-potential lines run through the A & B distribution station, in which is installed a second set of arresters of the multi-gap type. Beyond the arresters and disconnecting knife switches, the lines are carried through automatic overload switches and then to the main transformer station.

The station, of red brick and monolithic concrete, is 20x20 ft. It contains three 500-kw. 6600-3300 air-cooled transformers of the same type; also four Sturtevant fans directly driven by 2-h.p., 110-volt, induction motors for supplying the cooling air. From this station the lines are taken to the main distribution station located in the A & B hoist and compressor house.

(To be concluded.)

Search for Potash Deposits

An investigation into possible sources of potash salts in the United States is being made this year by the U. S. Geological Survey, under an appropriation by Congress of $20,000 for the current year.

One of the possible sources from which potash may be derived is in association with saline deposits left by the drying up of large bodies of salty waters, such as are known to have existed at one time in many of the now desert areas of the southwest, Oregon, Nevada, southeast California, in Utah, and elsewhere. It is hoped that by testing these saline deposits some may be found commercially rich in potash.

Samples of alkaline salts sent to Hoyt S. Gale, U. S. Geological Survey, Fallon, Nev., will be tested free of charge if a definite statement of the place from which they were obtained accompanies the samples. If so requested at the time that a sample is submitted for test, the accompanying information concerning the situation of the deposit will be treated as confidential; and the evidence thus obtained will not be used for the purpose of making land withdrawals.

Loss of Zinc in Mine Water

In the course of an investigation into the contamination of streams in eastern Kansas, due to the water discharged into them from zinc mines and concentrating mills of southwest Missouri, E. H. S. Bailey gives (U. S. Geological Survey *Water Supply Paper* No. 253) some interesting information as to the quantities of sulphates and, particularly, of zinc sulphate carried off in the water discharged from mines and mills of this district.

Originally, most of the milling water was either ground water, what would be called well water in other localities, or surface and rain waters stored for use in the processes of concentrating ore. They are often used over and over again, each time becoming more heavily loaded with mineral matter, especially with the sulphates of iron and zinc. In the following table are grouped a number of analyses of mine waters, supplied by W. G. Waring, of Webb City, Mo. Comparing these with other analyses of water discharged from zinc mills, which are not reproduced in this abstract, it is interesting to note that the water from mills carries no more zinc and sulphuric acid than the majority of mine waters. In only a few of the samples of mine waters was lead found to be present. One would expect lead to be precipitated in the presence of sulphuric acid, unless the water contained organic substances.

ANALYSES OF ZINC MINE WATERS

(By W. G. Waring; quantities in grams per liter.)

	Zinc	Ferrous Iron	Ferric Iron	H_2SO_4 Free	H_2SO_4 Combined
Maggie Murphy	2.690	0.402	.....	0.167	.....
Alabama Coon	2.807	0.322	.....	0.186	.....
Columbia, New York Co.	1.548	0.464	.....	0.157	.....
Monte Cristo, New York Co.	1.905	0.210	.....	0.127	.....
Dwight, New York Co.	0.935	0.291	.....	0.137	.....
Maggie Murphy	5.516	0.274	0.027	1.550	10.147
Coppinger & Fiske, Carterville	0.209	0.027	.....	.....	1.873
Alix mine	0.465	0.163	.....	.....	1.645
Stevens mine, Joplin	0.075	0.060	.....	.....	1.680
S. T. Nesbitt, Tuckahoe	0.420	0.482	.....	.....	3.240
T. P. Steers	1.055	0.510	.....	0.668	.....
St. Anthony, Carterville	4.867	4.150	2.300	2.273	.....

In discussing the nature of these mine waters, Mr. Waring says that the ground water of the district is usually devoid of zinc, iron and calcium sulphate, and is also lacking in free sulphuric acid when the ore deposits are first opened. After the metallic sulphides, especially pyrite, have been exposed to free air in the course of mining, if they are again leached, the mine waters then become highly charged with metallic sulphates. The best condition for solution of the metals then seems to be alternate drying and contact with water. In some places, where extensive deposits of pyrite lie above the zinc ore, as in the Galena mines, it is a well known fact that the water will be fairly free from mineral matter, after having been pumped down to a low level, as long as it is kept down; but when the water in a mine rises again on account of stoppage of the pumping, so that the water gets into the timbers, the water becomes excessively acid.

As soon as the zinc-bearing mine waters begin to flow across the country in streams, it appears that the zinc is precipitated by contact with calcium and magnesium carbonates in solution in the water.

This fact is quite clearly brought out by a series of analyses on samples of river water taken throughout the length of Spring river, from Carthage, Mo., down to Baxter Springs, Kan. At Carthage, the Spring river contains no observable zinc, and only 25 parts per million of SO_4; at Badger, the river having received the waters from a number of the smaller zinc camps, the proportion of zinc has risen to 16.2 parts per million of zinc and 70 parts per million of SO_4. Between Badger and Baxter Springs the river receives the drainage from the great zinc-mining camps of southwestern Missouri, Webb City, Carterville and Joplin, and of Galena and Empire, Kan., through a number of tributary streams. Turkey creek, for example, carrying most of the drainage of Joplin, contains at its mouth, just where it empties into Spring river, 47.3 parts per million of zinc and 308 parts per million of SO_4; Short creek, into which flows the drainage of Empire and Galena, contains the enormous total of 732 parts per million of zinc and 1625 parts per million of SO_4. And yet at Baxter Springs, eight miles downstream, samples taken at various periods fail to indicate the presence of zinc, while the percentages of SO_4 continue at about the same level as in the upper reaches of the river. This would seem to indicate that much of the zinc had been precipitated in the course of the stream, for otherwise the percentage of zinc would show an increase proportionate with that of the other sulphates. No data are at hand to show the amount of water flowing in Spring river, but when this information does become available it will be interesting to calculate the total amount of zinc that is dissolved by these waters and carried away.

Four Famous Districts Compared

By Augustus Locke*

Striking geological similarities are observable in comparing the Mother Vein of Guanajuato with the Comstock lode, and Pachuca with Tonopah.

*Mining geologist, Hampton, N. H.

In general, individual ore districts have distinctive characteristics. It is a matter of much interest, therefore, to find instances in which two ore districts are to any considerable degree identical. In recent visits to a number of well known mining camps, I was struck with the fact that the identities between the Comstock and Guanajuato and between Tonopah and Pachuca are remarkable.

Mother Vein of Guanajuato and Comstock Lode

The resemblances are chiefly as follows: (1) Each is the dominant vein and each has yielded the preponderant share of the production of the locality. (2) Each has a dip close to 40 deg. (3) Each has a vein filling consisting of a mixture of rock fragments and quartz. (4) Each attains a maximum width of several hundred feet. (5) Each carries orebodies scattered about irregularly within its mass. (6) Each lies in a great normal fault which has a displacement of some thousands of feet. (7) Each lies at the fault contact between Tertiary and pre-Tertiary rocks.

In any geological comparison between Guanajuato and the Comstock, it must be recollected that full geological information regarding Guanajuato is impossible to get. The great bonanzas were exploited decades or centuries ago, when miners groped in geologic gloom, supplying by perseverance what they lacked in science. Accurate and comprehensive knowledge regarding the size and shape of the orebodies—such knowledge, for example, as King supplies regarding the Comstock—is absolutely unobtainable.

In the most genuine meaning of the term, the two lodes are fissure veins. Coincidence of ore with a fault or fissure is, however, a characteristic of the majority of ore districts. It is not that the lodes follow faults, but that the faults are of extraordinary displacement which binds together Guanajuato and the Comstock and effectually distinguishes them from other ore districts.

The similarity in faulting is most strikingly exemplified by the existence, in the footwall of each lode, of a prominent fault scarp, constituting roughly an upward projection of the footwall. In the case of the Comstock, this is the dissected plateau of which Mt. Davidson is the most prominent feature. In the case of Guanajuato, it is a similar plateau, more thoroughly dissected, but still unmistakable. I am aware that the scarp character of the Mt. Davidson slope has, from time to time, been questioned, but have been entirely unable to find any weighty evidence to support the doubt.

Both the Comstock and the mother vein of Guanajuato are enormous lode-like bodies of mixed quartz and rock, carrying scattered bonanzas. Their orebodies have been essentially nonextensive and discontinuous, and have been discovered in large part by blind exploration. Each has produced within a length of 2½ miles a quantity of gold and silver about equal in value to that produced by the mother lode of California in a length of 100 miles.[1]

The fact that Guanajuato was actively productive for several centuries and the Comstock for less than 30 years, I assign to geographic rather than to geologic conditions. Mining on the Comstock was always intense and entirely typical of American energy. Mining in Guanajuato was, in the old days, always languid. Had the Comstock been in Mexico, and had Guanajuato been in Nevada, the duration of their respective lives would have been reversed.

The weakness of the Comstock hanging wall and the great size of the orebodies was the cause for the invention of the square-set system of timbering. Americans are inclined to believe that the problem of mining met and thus overcome at the Comstock was unique. Yet a similar, though (because of the stronger hanging wall) somewhat simpler problem had been met and overcome in Guanajuato centuries earlier—not, however, by timbering, but by filling, walling and arching.

The differences between the two lodes are chiefly as follows: (1) The gold-silver ratio (by weight) is, on the Comstock, 1 to 25, and in Guanajuato 1 to 100. (2) Water in Guanajuato is only moderately abundant; on the Comstock it is exceedingly abundant. (3) The funnel-shaped vertical cross-section, which constitutes a marked geologic feature of the Comstock, is, so far as known, absent from the Mother vein of Guanajuato. Its absence may be due to erosion.

[1]At present Guanajuato is producing six to seven million dollars' worth of gold and silver per year—probably a higher production than it has ever had before. The Comstock in 1910 produced about half a million dollars. Recent deep exploration has revealed an orebody concerning the importance of which I have no reliable information.

Pachuca and Tonopah

The resemblances are chiefly as follows: (1) The more important veins are, in both districts, limited to a particular, well recognized body of Tertiary igneous rock, termed earlier or lower andesite. (2) The lower andesite and its contained veins are capped by a barren later or upper andesite. (3) The veins are steep and narrow. (4) The vein fissures are cracks rather than extensive faults. (5) When unfaulted, the orebodies are extensive and connected. (6) When unaltered, the vein materials of the two districts are identical.

The lode faulting of Pachuca[2] and of Tonopah is measurable in hundreds rather than in thousands of feet. A large number of veins traverse the rock somewhat intricately. Their distribution and their relations at intersections strongly suggest that they have resulted, not from a general disruption, but from forces arising within the containing rock—such forces, for example, as would result from cooling shrinkage.

In both Tonopah and Pachuca, a certain Teritiary rock, the lower andesite, has the property of being ore bearing. Other rocks lack this property, or possess it to a far less important degree. In Tonopah, where the ore-bearing rock is a layer or flow not over 600 ft. thick, intercalated with other flows, the veins apex when they rise to the overlying rocks. When they descend into the underlying rocks, they usually weaken and perish. In Pachuca, because the size of the ore-bearing lower andesite is greater, the limitation of the ore to a particular body of rock is less striking. Exploration has been carried in it to a depth of 1700 ft.; its bottom has not been found. As in Tonopah, however, the productive veins apex when they reach the overlying upper andesite. Taken altogether, such ore districts as those of Tonopah and Pachuca constitute an argument in favor of an hypothesis of ore origin closely allied with that of the containing rock.

The differences are chiefly as follows: (1) The Pachuca ore district is much larger than that of Tonopah. (2) Post-vein faulting in Tonopah is of vital importance; in Pachuca it is insignificant. (3) Pachuca is exceedingly wet; Tonopah is dry.

In certain portions of Tonopah, post-vein faults are extremely abundant—so abundant, in fact, that the ore occurs in elusive rich bits which serve only to tantalize the miner. Everywhere in Tonopah the faulting of orebodies is conspicuous; it accounts for a portion of the high costs

[2]Here is intended to include Pachuca and Real del Monte.

which are prevalent there. As stated above, the post-vein faults in Pachuca are generally insignificant.

The Pachuca mines have been wet almost from the surface; the quantity of water now being pumped is comparable with that being pumped on the Comstock, and is enormous. The Tonopah mines are dry to the greatest depths attained (1300 ft.). In Pachuca mining has been prosecuted chiefly above water level. In Tonopah, silver haloids, ruby silver and other secondary minerals are abundant. In Pachuca, the only secondary silver mineral now commonly encountered is wire silver. The haloids, etc., have been found in abundance in the past, but in only superficial portions of the veins.

The most striking and important difference is that of size. In Tonopah the lower andesite is known to exist with a thickness of 600 ft. and less, over an area of one square mile. In Pachuca, the lower andesite is known to exist over an area of some scores of square miles and it is productive over at least 20 square miles. Its depth is unknown, but it is at least 1700 ft. Pachuca, then, has an ore district many times bigger than that of Tonopah.

The productions of the two localities are now about the same. Tonopah has been producing for eight years, and Pachuca for 350 years. In Tonopah there is still considerable promising territory ahead of exploration, where the lower andesite is hidden by the cap rock. In Pachuca, there is a large amount of such territory, and, in addition, some of the veins are yielding good ore at the greatest depths attained in mining (1500-1700 ft.). Tonopah will, no doubt, live for some time yet; Pachuca, already venerable, will live for many years, and, perhaps, for many decades.

Kilovolt Amperes

The question is asked at frequent intervals, what are kilovolt-amperes and how do they differ from kilowatts? The following answer is given in *Power:* Volt-amperes are volts × amperes and a kilovolt-ampere is 1000 volt-amperes.

In a direct-current circuit, volt-amperes are exactly the same as watts because the current and electromotive force are steady and it is therefore impossible for them to be out of phase with each other.

In an alternating-current circuit the volts and amperes rise and fall many times per second; if they rise and fall exactly in unison, both reaching their maximum values at the same instant, they are "in phase" and the power factor of the circuit is 100 per cent. That is, all of the power represented by the current and pressure is available power. Then, volts × amperes, or volt-amperes, are equal to watts; consequently, kilovolt-amperes are kilowatts.

When the current and pressure do not rise and fall exactly in step with each other, the power factor is less than 100 per cent. because when the current is maximum the voltage is not and when the voltage is highest the current is not; consequently the maximum combined effect of the two cannot be obtained and it is the *combined effect* that makes power.

If at one instant the pressure is at its maximum of, say, 100 volts and at that same instant the current has reached only 800 amperes, the *instantaneous* power is $100 \times 800 = 80{,}000$ watts. If the current reaches its maximum of 1000 amperes, say, when the pressure has dropped to 80 volts, the instantaneous power is again 80,000 watts. But under these conditions the maximum power of $100 \times 1000 = 100{,}000$ watts can never exist, because the pressure and voltage do not reach their highest values together.

The true power (watts) is the mean (the quadratic average) of the many instantaneous power values which exist during the alterations of the pressure and current. As the instantaneous power never reaches the possible maximum, the mean power cannot be the full value represented by merely multiplying the pressure and current together; that gives the volt-amperes and volt-amperes may or may not represent power. If a current of 1000 amperes lags behind a pressure of 100 volts by one-quarter of a cycle, there are 100,000 volt-amperes in the circuit, but absolutely no available power because the power factor is then zero; when the pressure is maximum the current is at zero in its cycle; and when the current is at its highest point the pressure is at zero. (Power = EI *cos.* α, where α is the angle of lag.)

The power factor of a circuit is the proportion of apparent power (volt-amperes) that is actual, available power (watts). If a current of 1000 amperes lags behind a pressure of 100 volts by a full tenth of a cycle, the power factor is 80 per cent. Therefore, although the volt-amperes are 100,000, the real power is only 80 per cent. of that, or 80,000 watts.

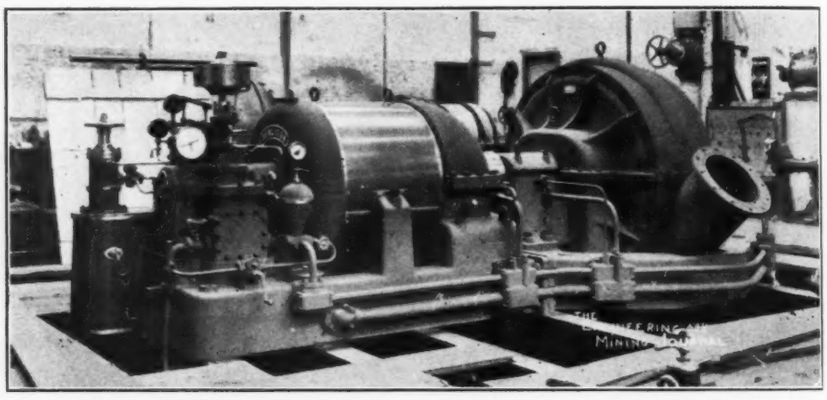
Efficiency of the Turboblower

By L. Garrett Smith*

There is no doubt that the type of furnace requiring forced blast, which includes the converters used in iron, copper, lead and nickel metallurgy, takes the foremost place among the several kinds used at present in modern smelteries. Although the success of the electric furnace in iron smelting, and the practical possibilities of the value of electricity in copper smelting, as shown by experiments at Aachen under Professor Borchers, point to the probability of the electric furnace not only coming to stay but also to conquer; yet we can be certain that the blast furnace will hold its own for many years to come.

Importance of Concentrating Zone of Fusion

The great advantage of the blast furnace over its older competitors lies in the concentration of the zone of fusion,



1000-H.P. Steam Turbine and Turboblower

and it is curious to notice that it is owing to further possibilities in this direction that the electric furnace is threatening the blast furnace. Decrease the size of the zone of fusion, other conditions remaining the same, the amount of heat lost per unit of time in the process is decreased, that is, the rate of smelting is increased. As an example of the above, one of the conclusions at which Sticht arrived during his experiments in pyrite smelting, was that he got better results by increasing the hight of the furnaces and at the same time using a larger weight of air per unit of time and hearth area.

It is certain that the limit in this respect has not been reached, as improvements are still being sought to increase the rate of smelting, to do which it is necessary to force a larger quantity of air through the furnace. Are then, those stupendous blowing engines used in the iron industry to be still

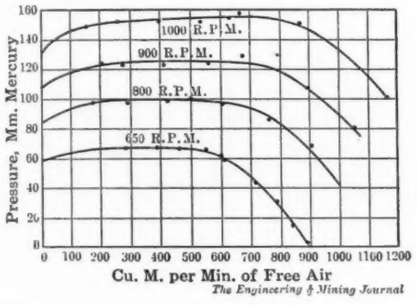
*Metallurgical engineer, Fischerstr. 21, Freiberg, Saxony.

further enlarged? The experience gathered of late years in Europe, especially in Germany, with blowers of the centrifugal type, inclines one to answer this question in the negative, inasmuch as the bigger engines are found to be better replaced by these new machines.

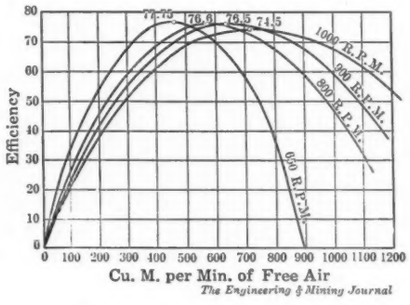
History of the Turboblower

About 10 years ago, Professor Rateau, of Paris, was the first to show the possibilities of procuring high pressures with a centrifugal machine. A. von Ihering, in his well known work on blowers[1] mentions that "this new discovery of Rateau's will cause a great change in the centrifugal fan and pump industries" and that "it will undoubtedly be used in all cases where pressures of one millimeter of water are required, for instance in blast furnaces, cupolas, converters, etc." Nine years have elapsed since this great change was predicted, and starting in Germany, it is now slowly but surely taking place.

The advantages of the steam turbine, especially in the case of large units, as compared with the reciprocating cylinder engine, in the smaller space required, the economy in steam, oil and labor, and the liability to knock, have been the cause of its gradual adoption. In the same way the turboblower is starting a successful campaign against the older form of blowers.



Pressure and Amount of Air Delivered at Constant Speed



Efficiency Diagram for a Turboblower

The cylinder blower draws air with its piston into the cylinder, which, during the return motion, becomes compressed, and is forced out as soon as it acquires a certain pressure. The natural outcome of the foregoing is, that in spite of a heavy flywheel, shocks are unavoidable, the air is not delivered with absolute regularity, and the cylinder has to be kept carefully oiled; also, as the velocity of the piston cannot overstep a certain limit, the compressor has to be of vast size, the area of the piston being, roughly speaking, inversely proportional to its velocity.

The action of the turboblower is totally different; the air is drawn into the machine at the center of the moving wheel, where the velocity is least; passing along the blades, it acquires a great momentum through the action of centrifugal force, and is forced under pressure into the spiral-shaped external passage, which surrounds the outside, and ends in the delivery aperture. Thus the movement is purely rotary and the absence of all shocks and knocking allow the foundations to be much smaller than in the case of a similar-sized cylinder blower. Friction occurs only in the bearings, so that only these parts require oiling, and wear and tear is reduced to a minimum. It follows further that the attendance necessary is extremely simple, the air delivery absolutely constant, and the space required, and consequently the cost of installation, considerably lessened. An accompanying illustration shows a 1000-h.p. steam turbine and turboblower, built for an iron blast furnace by the Kühnle, Kopple & Kausch. The compactness of this powerful combination speaks for itself.

Efficiency of Turboblowers

Although the actual efficiency of the turboblowers is not any higher than that of their competitors, yet it has been found that under abnormal working conditions there are certain advantages pertaining to the class of centrifugal machines. These are illustrated in the diagrams accompanying, the data for which were obtained from experiments carried out recently by Professor Bonte.[2]

In the first, the number of revolutions per minute was kept constant, and the curves show the all important fact that the pressure was also almost constant for a considerable period, i. e., that even in the case of variations in the amount of air delivered, the pressure remains practically the same.

Combined with the above, the efficiency was determined during each experiment, and the results are shown graphically. The curves demonstrate the fact that with a constant number of revolutions per minute and constant pressure, there is an amount of air for which the efficiency reaches a maximum; on the other hand, consideration of the top of the curves shows the possibility with a constant number of revolutions per minute of varying to a considerable extent the amount of air delivered without appreciably altering the efficiency; a further triumph of the centrifugal machine.

[1] "Die Gebläse" (1903), pp. 418, 428.

[2] *Zeit.* d. Vereines Deutscher Ingenieure, 54, No. 40; p. 1663.

Carnotite as a Source of Radium

The discovery of radio-activity in ores of uranium has led to an active search for minerals of this nature throughout the world.

The deposits of carnotite in southwest Colorado and adjoining areas of Utah and New Mexico are now yielding a much more suitable material from which to extract radium. Carnotite is a variable and complex combination of the oxides of uranium and vanadium. It is a soft, amorphous, powdery mineral of a bright canary-yellow color, and is found in small seams and pockets scattered through beds of sandstone. Ore of good commercial grade contains 10 per cent. vanadium oxide and 10 per cent. of uranium oxide; when of such grade, it is exceedingly valuable for the reason that the two oxides can be separated and saved by comparatively simple leaching processes. The carnotite found in southwetern Colorado possesses a high degree of radio-activity; a sample from near the surface, when submitted to Mme. Curie, was found to possess a radio-activity of 6.2 on the scale adopted for experiments of that nature.

Bohemian pitchblende, from which the present world's supply of radium is mainly secured, ranged from 8.3 down to 5 on samples taken from the three mines worked at that time. Cornish pitchblende gave a radio-activity of only 1.6 and 3.5 on two samples submitted to test. The Colorado pitchblende, which is mined in Gilpin county as a source of uranium salts, has a radio-activity less powerful than that of Bohemia. For these reasons, in the opinion of E. Shaff-Regelmann, of New York City, the Colorado carnotite is by far the most satisfactory mineral in this country from which to recover radium.

New Use for Lithia

It is stated that large quantities of lithium carbonate are being consumed by the Edison laboratories in the manufacture of recent types of storage batteries. The carbonate used for this purpose is now being manufactured by the Western Chemical Company, of Omaha, presumably from lithium ores produced in the Black Hills. If further investigations of the storage battery prove it to be economical, the production and the consumption of lithium ores will doubtless be greatly stimulated.

Big Sandy Coalfields, Kentucky

By W. T. Griffith *

An area of 3000 square miles in eastern Kentucky, containing 10 coal seams, is now being tapped by railroads and developed by important and resourceful companies.

*Mining engineer, Pikesville, Ky.

The working coalfields of Big Sandy region extend from Louisa, at the junction of Tug and Leviska forks of Big Sandy river, to the Cumberland or Pine Mountain fault, and in a southwest direction to the headwaters of the Licking river and the North fork of the Kentucky river; it embraces an area of 3000 square miles or more. The existence of this field has been known for 70 years, but only recently has it come into prominence, through the activities of the Northern Coal and Coke Company, the Big Sandy Company, and the Consolidation Coal Company, and through the extensions of the Chesapeake & Ohio railway, and the Louisville & Nashville railway into this district.

The earliest workings probably were situated across the river from Prestonsburg, on the land now being worked by the Colonial Coal and Coke Company.

This mine, then owned by the Kentucky Coal Mining Company, began operations about 1840 and abandoned them about 1856 on account of difficulties in getting the coal to market, the Big Sandy river being uncertain as far as navigation was concerned, ranging from two or three feet at low water to 25 or 30 feet at high water.

Water Transportation

The country being well timbered at that time, it was the practise of the miners to build their barges near the mines, then load them with coal, and on a rise of the river float them out to the Ohio, and then down to the Cincinnati and Louisville markets. Here the barges were sold to go into the Pittsburg trade, it being impracticable to tow the barges back up the Sandy.

It was on the strength of this coal in the Cincinnati market that the Peach Orchard mine was opened in the later 50's, and about 1881 the old Chateroix railroad was built.

About 1858, another attempt was made to barge out coal from a mine opened near the mouth of Hurricane creek, near the Pike-Floyd county line on Levisa fork. But this also proved a failure, and from that time till the late 90's nothing was done in this field, in the way of development, though John C. C. Mayo, the Kountz brothers and a few others, having faith that eventually some means of transportation would be provided, commenced as early as 1889 to buy up some of the coal lands.

In the later 90's a movement was started to provide slack water by a system of locks and dams, on which the Government is now at work. Five dams are now completed, three between the mouth of Big Sandy and Louisa and one each on Tug and Levisa forks. And when all the dams contemplated are finished there will be slack water to Williamson on Tug fork and to 12 miles above Pikeville on Levisa fork.

Railroad Connections

The Chateroix road having been purchased and extended to Whitehouse by the Chesapeake & Ohio, that company in 1906 extended the Big Sandy division from Whitehouse to Elkhorn City, on Russell fork, with a branch up Marrowbone creek to Hellier. In 1909 and 1910 the Consolidation Coal Company purchased a large tract on Millers creek and built a road up that stream, on which are situated four mines. In the autumn of 1910 the same company purchased of the Northern Coal and Coke Company, and others, about 100,000 acres at the head of Shelby, Elkhorn and the North fork of the Kentucky river, and is now building about 30 miles of railroad, from the mouth of Shelby creek up to Shelby Gap. The Louisville & Nashville, having secured the control of the Lexington & Eastern, is extending that road from Jackson up the North fork of the Kentucky river to the same place. These extensions are now under construction. In addition to the above, the Chesapeake & Ohio has made surveys for an extension from The Forks, 12 miles above Pikeville, up Levisa fork to Grundy, Va., and the Louisville & Nashville has made surveys for a line from Shelby Gap down Elkhorn creek to Elkhorn City.

The Carolina, Clinchfield & Ohio, which is building north from Charleston, S. C., and is now within 40 miles of Elkhorn City, expects to complete that interval within a short time and will be able to connect at that point with both the Louisville & Nashville and the Chesapeake & Ohio, thus giving this territory a direct line to the southern seaboard. The eastern part of the field is served by the Norfolk & Western railway, which, about 1890, built a line down the West Virginia side of Tug fork to Pigeon creek, then up Pigeon and down Twelve-pole to the Ohio river, thence to Columbus; in 1904 and 1905 it continued the line down Tug fork to Kenova.

Geological Section

The rocks of this territory are lower Carboniferous. The marketable coals are found in a series of shales and sand rocks corresponding to the Conemaugh, Allegheny and Pottsville formations of Pennsylvania or the Norton formation of Virginia, and overlying the Lee conglomerate.

There are 10 workable seams between the Lee conglomerate and the horizon of the Flat-woods seam. Here I wish to make an amendment to R. W. Stone's report, U. S. Geological Survey, Bull. 348, p. 25. Since that report was made I have found a double seam of 5 to 6 ft. of coal with 8 to 15 in. parting, lying about 40 ft. below the upper Elkhorn seam. At the time of Mr. Stone's report, owing to the distance apart of openings and the irregularity of dip, this double seam and the true upper Elkhorn had been taken as the same seam, but openings now made one over another in the same hillside have demonstrated that they are two separate seams.

These 10 seams may be divided into three groups: The upper group, lying above the upper Elkhorn, is so high in the hills in the Russell fork and Kentucky river territory that no attempt has been made to work it, but on the Tug fork side it is worked, being represented by the Thacker Splint and Glen Alum seams, and the seams above them.

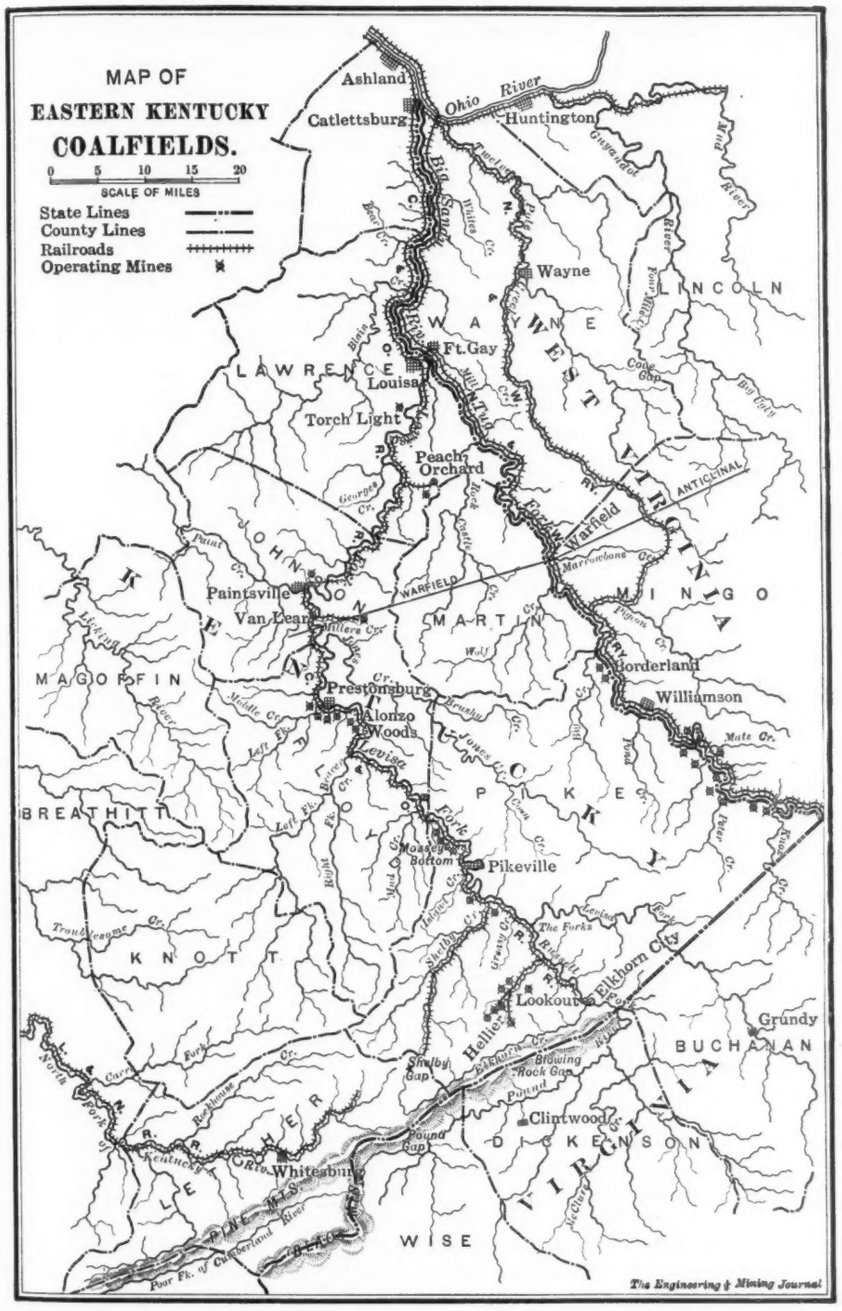
The middle group, consisting of the upper Elkhorn, the double seam and the lower Elkhorn, in the southwestern part of the field, yield a soft, coking coal, exceptionally low in sulphur, phosphorus and ash, and producing a coke equal to Connellsville. The upper Elkhorn is the one that is mined in all the workings on Marrowbone creek, and I believe it to be the same as the Vulcan seam of Tug fork.

Below this group of Elkhorn coking coals are four seams of splint coal, which are known to be above drainage only along or near Russels fork in the southern part of the field. The correlation of the seams of the southern part of the field with those extending north from Pikeville has not been carefully made and there seems to be a difference of opinion in the different published reports.

It is my opinion that the seam worked by the Colonial Coal and Coke Company and the other operators near Pres-

tonsburg is the upper Elkhorn, though at this point the coal is much harder and higher in sulphur and ash; it is a coking coal, though not as good as that of the Marrowbone, Shelby and Levisa fork territory.

At this particular point the double seam, lying about 40 ft. under the upper Elkhorn, is so split up as to be nearly lost sight of, but about four miles up Middle creek an opening shows it in its normal condition, as seen on Marrowbone and the Caney fork of Shelby, that is, 5 ft. of coal having about 9 in. of slate parting near the middle of the seam.



Along Levisa fork in Pike and Floyd counties, the upper Elkhorn and the double seam are the only ones worked commercially at present, and of these the upper Elkhorn is the most constant. This seam is distinguished by a band in the top of the seam, of 3 to 6 in. width, of what has been termed "laminated" coal; I do not think that this is a fair term as applied to this seam, when compared with the laminated streak of the lower Elkhorn seam. In the upper Elkhorn, this streak, while much broken, in many places shows distinct butt and cleat joints, forming blocks of ½ to 1½ in., while the laminated streak characteristic of the lower Elkhorn seam is a true lamination 6 to 15 in. wide, made up of alternate layers of coal and slate.

An average of 20 samples of the upper Elkhorn gives the following analysis: Moisture, 1.57; volatile combustible matter, 34.18; fixed carbon, 59.68; sulphur, 0.62; ash, 4.57; thermal capacity, 14,382 B. t. u.

The double seam is worked at present by the Cabin Branch and the Steel Coal companies. It consists of two benches, generally about 3 ft. in the lower bench and 2 ft. in the upper bench, separated by 3 to 8 in. of parting.

Analyses of Cabin Branch coal are as follows:

Constituent	Upper Bench	Lower Bench
Moisture	1.95	2.25
Volatile combustible matter	36.42	38.15
Fixed carbon	55.10	56.02
Sulphur	0.90	1.10
Ash	5.63	2.48
	100.00	100.00

Workings in the Elkhorn Seams

The lower Elkhorn seam was opened and worked for a time on Marrowbone creek, but owing to the liability of injuring the upper seams, and also to the large percentage of laminated coal which can be cleaned only by washing before it can be used in coke ovens, work in this seam has been suspended for the time being.

Both the upper and lower Elkhorn seams are valuable coking coals, and are being worked by the Marrowbone Coal and Coke Company at Lookout. This company originally built 10 beehive ovens for testing purposes, and after a thorough test of each seam and combinations of the seams, it is now operating 50 ovens and preparing to build 200 more.

The Elkhorn Consolidated Coal and Coke Company of Hellier, is now building a bank of ovens and expected to have 50 in operation by August 1. The Mitchel Coke Company, which controls the Pike mine, at Hellier, will at an early date put in a large bank of Mitchel ovens.

The Consolidation Coal Company, in addition to building its railroad up Shelby creek, is starting to build a large plant at Jenkins, near Shelby Gap. I am informed that it has contracted for 500 houses and that it has a large corps of engineers in the field working up the necessary data for developing the 100,000 acres owned by the company in that vicinity.

Along Tug fork, and tributary to the Norfolk & Western, are seven mines on the Kentucky side and 17 in West Virginia, most of which are working in the upper series of coals.

Within the last few years, large companies, like the Northern Coal and Coke Company, Beaver Creek Coal and Coke Company, Mason Coal and Coke Company and the Big Sandy Company have been purchasing coal rights from the settlers so that probably one-third of

this vast territory is controlled by seven companies or their allied interests.

One great drawback has been the old Virginia land grants; but after a legal battle through all the courts they have been declared forfeited by the U. S. Supreme Court, so that now titles in this section are, or can be made, as good as in other sections of the country. What the section now needs is active capital for development. The accompanying map gives the location of all points named in this article. I will refer those who wish a more detailed description of the coals to: Crandall's report, Kentucky Geological Survey, Bulletin No. 4; Coal Resources of Russell Fork Basin, U. S. Geological Survey, Bulletin No. 348; Economic Geology of Kenova Quadrangle, U. S. Geological Survey, Bulletin No. 349.

First Aid Meet at Pittsburg

The program of the first national safety demonstration, to be held at Pittsburg, Penn., Oct. 26 and 27, under the auspices of the U. S. Bureau of Mines, American Red Cross Society and Pittsburg Coal Operators' Association, contains some novel features. At Forbes field will be held a noncompetitive exhibition of skill in first-aid work on Oct. 27, from 9 a.m. to 1 p.m. The rules governing the exhibition are as follows: Not more than one team of five men shall represent any one coal mine, the U. S. Bureau of Mines or State mine departments, except that coal-mining companies operating more than one mine may enter additional teams representative of groups of miners, helpers, trapper boys, or other mine workers; all persons entering must submit certificates showing that they are, or have been, *bona fide* mine workers; all entries close one month prior to date finally selected for the meet.

Coal companies entering teams are invited to present, not later than one month in advance of the meet, a list of five events as their choice, these to be submitted to the managers, who will select five for adoption from the various events suggested, each entering team to exhibit in those events suggested by them and such others of the five as they may elect. All teams to exhibit in unison. Should any unusual or valuable events be suggested, the managers may increase the program by one or two such special stunts.

In addition to the five first-aid events there will be: A representation of a coal-dust explosion, with rescue by helmetmen and first-aid treatment; exhibition of skill in adjusting and use of rescue apparatus by teams of four, with a captain, entries to be as above for first-aid teams; an exhibition in use of fire extinguishers upon a fire by members of the rescue crews.

Souvenir badges of the American Red Cross, souvenir buttons of the U. S. Bureau of Mines and souvenir programs to be presented to individual entrants; a souvenir first-aid box to be presented to each team entering; a souvenir pennant with the name of the company sending entrant, and to be used on the field as a marker, to be presented to the company represented. There will be introductory remarks by the director of the Bureau of Mines and a member of the executive committee of the American Red Cross. Presentations of souvenirs will be made at the close of the exercises in brief addresses by speakers of national repute.

Missouri Coal Situation

Missouri's production of coal in 1910 was 2,982,433 tons, against 3,756,530 tons in 1909, a decrease of 774,097 tons, or about 20 per cent., according to E. W. Parker, of the U. S. Geological Survey. As in other States of the Mississippi valley, except Iowa and western Kentucky, Missouri's coal output was materially reduced by the strike which began on April 1 and was not officially called off until Sept. 15. Counting the additional time required for putting the mines into shape for operation after the order to resume work was issued, fully six months' producing time was lost.

The actual time lost and the decrease in production was not, however, 50 per cent. of the normal output or working time, for the strike order was anticipated and for the last three months of the year the mines were operated to the fullest possible extent in order to store up a supply of fuel, and again, when mining was resumed, every effort was made by the operators and miners to make up for lost time. The scarcity of coal, due to the strike, naturally enhanced prices in Missouri, and the value of the product in 1910 was but 13.83 per cent. less than that of 1909, the figures being, respectively, $5,328,285 and $6,183,626.

Not all the mines in Missouri were affected by the strike, nor did all the affected mines continue idle for the entire time. The total number of men employed was 9691. The number of men on strike was 7774, with an average of 157 days' idleness. Even if the coal-mining industry were free from the biennial wage troubles, says Mr. Parker, the prospects of any marked increase in the production of coal in Missouri are not favorable. Surrounded as it is by other coal-producing States, Missouri finds its output restricted mainly to local markets. Moreover, the larger cities of the State which are near the boundary lines draw their fuel supplies from other fields.

A more potential factor, however, in limiting the demand for Missouri coal in the last few years, has been the notable increase in the production of petroleum and natural gas in the mid-continent fields of Kansas and Oklahoma. Natural gas and oil are being extensively used as fuel for manufacturing in Kansas City and other cities contiguous to the Missouri coalfields, and as long as these more desirable fuels are available, the demand for Missouri coal is not likely to increase materially. The interruptions to their regular supplies of fuel caused by the biennial conflicts between coal operators and their miners, have created a tendency on the part of manufacturers to substitute oil and gas for coal.

Pacific Coast Coal Trade

The fuel requirements of the Pacific coast and the methods of meeting them are of especial interest at the present time because of the agitation in regard to the development or nondevelopment of the coal resources of Alaska. The present consumption of coal on the Pacific coast, according to E. W. Parker, of the U. S. Geological Survey, is not large and the successful operation of any coal mines in Alaska will depend on naming prices attractive to the development of manufacturing industries. For railroad and manufacturing purposes the consumption of oil, particularly in California, largely exceeds that of coal—in fact, for railroad use oil is practically the only fuel. The principal domestic fuels are wood and gas made from oil. Recently oil itself has assumed importance as a domestic fuel. The per capita consumption of coal in California, Oregon and Washington averages not much over one ton, while the average consumption in the United States as a whole is about 5¼ tons for each inhabitant.

The principal source of coal supply for the Pacific coast is the State of Washington, the output of both California and Oregon being at present small. In 1910 the production of coal on the Pacific coast was 3,903,983 tons in Washington, 62,707 tons in Oregon, and 11,164 tons in California.

The total consumption of coal on the Pacific coast in 1910 was 4,812,398 tons. The imports of coke to Pacific coast ports (exclusive of Hawaii), as reported by the Bureau of Statistics of the Department of Commerce and Labor, were 114,061 tons in 1910.

Including 761 tons of coal sent from Puget sound to Bering sea, the total quantity of coal shipped into Alaska in 1910 was 98,420 tons, of which 8178 tons went from British Columbia, and 15,877 tons from Washington. The production within the Territory was reported at 1000 tons, or 1 per cent. of the consumption.

The Pittsburgh & Conneaut Dock Company recently unloaded 10,234 tons of ore from the steamer "Thomas Lynch" in 4 hr. 6 min. at its Superior dock, Ashtabula, O., which is equipped with four 15-ton Hulett electric unloaders. The average per hour per machine was 637.6 tons.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. W. Neill, of Pasadena, Cal., has been visiting Salt Lake City, Utah.

G. W. Loper has returned to Spokane, Wash., from British Columbia.

John Bresnahan, of Spokane, Wash., is visiting the Jarbidge camp in Nevada.

Edward F. Massam has returned to Spokane, Wash., from a trip to France.

S. F. Shaw will be in Porcupine, Ont., in September and October in the interest of New York parties.

C. H. Halcomb, of Syracuse, N. Y., has been visiting mines owned by him in the Republic district, Washington.

Albert E. Goodell, of the International Smelting Company, has returned to Tooele, Utah, from a business trip to Montana.

J. Campbell Maben, Jr., has been elected a director of the Sloss-Sheffifield Steel and Iron Company to succeed the late Col. H. C. Seixas.

C. B. Whitwell, of San Francisco, has gone to White Horse, Yukon Territory, to examine and report on gold claims, and will return in about a month.

William G. Sharp, president of the United States Smelting, Refining and Mining Company, has been visiting the company's mines and works in Utah.

J. L. Safford, of Winnemucca, Nev., is back from a trip of three weeks to Utah and Idaho points, where he examined mining properties for San Francisco people.

Francis J. Peck, of Francis J. Peck & Co., mining engineers and chemists, Cleveland, O., has just returned from making an examination of several properties in Nevada.

T. D. Smith, formerly with the Commercial Electrical Company, of St. Louis, Mo., is now with the electrical department of the Mexico Mine and Smelter Supply Company, at Mexico City.

Wilbur A. Hendryx, general manager of the Hendryx Cyanide Machinery Company, sailed for London Aug. 31, to be there a week or so, and will then sail for South Africa to put in a Hendryx plant on the Rand.

Frank H. Probert is making a professional visit to the Ray Central Copper Mining Company's property, at Ray, Ariz., where he will be engaged for 10 days. From there he goes to visit the Alamos district, Sonora, Mexico.

Charles B. Davis, principal assistant engineer of the coal mines division of the Tennessee Coal, Iron and Railroad Company, has resigned his position, effective Sept. 15, and will open an engineering office in Birmingham.

Raymond C. Brenner, of the department of chemistry of the University of Arizona, has associated himself with Professor R. K. Duncan, of the University of Pittsburg, at which place he will make a study of the smoke problem.

Charles L. Parsons, professor of chemistry at New Hampshire College, Durham, N. H., and also secretary of the American Chemical Society, has been appointed chief mineral chemist of the Bureau of Mines, at Washington.

Professor Erasmus Haworth, of the University of Kansas, has been engaged by the Public Utilities Commission of Kansas to make investigation of the gas supply of Kansas and Oklahoma. He will be engaged in this work for several months.

Percy E. Barbour has assumed the management of the Uwarra Mine Company, at Candor, N. C. This is a reorganization of the old Montgomery Mining Company and is owned by Baltimore and Paris people. Mr. Barbour is now at the mine, making arrangements for its active working.

The duties of general manager of the Southern Iron and Steel Company are now being cared for by James Bowron, president, Birmingham, Ala. It is probable that the office will not be filled till the merger with the Alabama Consolidated Coal and Iron Company is completed.

Edwin Higgins, who for the past five months has been engaged in opening up properties in the Randsburg, Cal., district, has returned to Los Angeles, where he has reopened his office at 312-314 Trust and Savings building. He will visit the properties in the Randsburg district occasionally in the capacity of consulting engineer.

F. B. Keiser, of Birmingham, Ala., vice-president and general manager of the Southern Iron and Steel Company, and H. L. Geismer, of Chattanooga, Tenn., general superintendent of the Chattanooga division of the same company, have severed their connection with that company and are opening an office in Birmingham, Ala., under the name of the Keiser-Geismer Engineering Company. They will also handle machinery. Their successors have not yet been appointed.

OBITUARY

John C. Dods, superintendent of the Cherryvale works of the Edgar Zinc Company, died, Sept. 1, after an illness of about three months.

James Christie, president of the Engineers' Club of Philadelphia, and vice-president of Franklin Institute, died Aug. 24, at his summer home in Atlantic City, N. J. Mr. Christie was widely known throughout the country as a mechanical engineer. Born in 1840, near Ottawa, Can., he was engaged in many prominent works. For 35 years past he had been engaged as engineer at the Pencoyd iron works of the A. & P. Roberts Company, near Philadelphia.

SOCIETIES and TECHNICAL SCHOOLS

Missouri School of Mines—Ralph D. Brown has been appointed instructor in civil engineering, at Rolla, Mo. He is a graduate of Miami University, and of the civil-engineering department of the University of Ohio. Since 1909 he has been in the employ of the O'Gara Coal Company, at Harrisburg, Ill., as assistant engineer.

Congrès de la Proprieté Miniere—The meeting of this association for 1911 will be held at Lille, Belgium, Sept. 14 to 16. The congress discusses mine legislation in France, Belgium and Holland. The special topic this year will be the delay in granting mining concessions under the French law. Applicants for such concessions have received as yet no answer to their petitions filed as long ago as 1907, and the situation has become grave, as no new mines can be opened. Safety in mines will also be an important topic of discussion. A large number of papers will be presented. The secretary of the congress is Emile Didier, whose address is 23 Rue d'Amiens, Lille, Belgium.

South Dakota Engineering Society—The first annual meeting of this society was held in Deadwood, S. D., Aug. 23, 24 and 25. This is a new association and is officered as follows: S. H. Lea, State engineer for South Dakota, president; A. McDaniel, vice-president; R. G. Culbertson, of Mitchell, S. D., secretary-treasurer. Among the papers read were the following: "Valuation of Public Utilities," C. C. Witt, formerly engineer of the South Dakota Railway Commission; "Improvement of Public Institution Grounds," Mr. Lea; "Electrical Accidents," C. W. Hough, Deadwood, general manager Consolidated Power and Light Company; "Design of a 50-ft. Reinforced Concrete Arch," C. G. McHugh, Mitchell; "Value of Hydroelectric Power as Compared with Steam and Gas Power," W. R. Putnam, Rapid City, manager Dakota Power Company; "The Homestake Mine," B. C. Yates, Lead, civil engineer with the Homestake company. Several other papers were read by title and will be printed in the proceedings. On Aug. 24 the visitors were escorted through the Ellison hoist, of the Homestake, taken down the shaft to the 1100-ft. level, walked through the workings to the Star shaft, were hoisted to the surface, and visited one of the mills and the machine shop. The following day a number of points of interest around Deadwood and Lead were visited in the morning, and in the afternoon members left on the train for Spearfish to look over the Homestake hydroelectric installation.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

Aug. 30—In the event of a loan being consummated by the Nicaraguan government in the United States, the new railroad extending from the Atlantic to the Pacific will be completed, and this will create an additional demand for fuel oil. The agency has also begun its shipment of fuel oil to the Great Northern railroad at Seattle. The tank steamer, "William F. Herrin," will be employed continuously in carrying the Great Northern supply. The initial shipment was 35,000 bbl. The tank storage capacity of the railroad is 220,000 bbl. in four tanks at Everett, Wash., and smaller reserve tanks ranging in capacity from 65,000 to 100,000 gal. at Seattle, Delta, Burlington, Leavenworth, Cascade tunnel and Skyhomish. Passenger and freight locomotives, to the number of 163, have been changed from coal to oil.

Denver

Sept. 1—The Moorehead Mining and Milling Company was awarded damages to the amount of $46,072 against the Liberty Bell Gold Mining Company for trespass on veins belonging to the plaintiff company. The case was tried at Telluride. The Moorehead company asked for over $500,000 damages. This has been one of the hardest fought cases ever tried in the courts of San Miguel county. Witnesses were summoned from various parts of the country, expensive models were made of the territory in dispute; mining engineers, geologists and some of the best legal talent in the State were employed. The Liberty Bell gave notice of an appeal, and the Moorehead company asked for a temporary restraining order, prohibiting the Liberty Bell company from working on the ground in dispute; this order was issued.

A slag pile at the old Argo smeltery in North Denver, which the trustees of the Boston & Colorado Smelting Company agreed to sell to M. Pringle and associates for 30c. per ton, is now alleged to be worth from $500,000 to $1,000,000, according to a suit filed in the district court today. Robert H. B. Little applied to the court for a temporary injunction, restraining H. C. Reno from collecting for shipments to the American Smelting and Refining Company, and ordering the latter to pay the proceeds into court. Reno and the American Smelting and Refining Company are made the defendants in the suit.

The Denver *Republican* noted the following in a recent issue: "The gross production of the Stratton's Independence, Ltd., of Cripple Creek, computed to July 1, 1911, has been more than $22,000,000, or $4,000,000 more than the figure heretofore estimated."

Definite word has come that the Roosevelt drainage tunnel is to be extended. At a meeting of the directorate of the tunnel company, held in Colorado Springs, it was decided to drive the main head forward a distance of 1500 ft. The question of finances has been the principal point at issue in holding back work upon the further extension of the tunnel, but this matter is practically settled in the announcement that $27,500 of the $50,000 required has been subscribed and that the balance will shortly be secured. At the present time the tunnel is in 15,740 ft. and has already lowered the water-level of the camp. The rate at which the water is disappearing has, however, not been sufficiently rapid to satisfy the desires of the operators, so that the news of the immediate taking up of the work will be received with much satisfaction.

Butte

Aug. 30—The plans for the 300-ton concentrator for the Ophir mine of the Butte Central Copper Company have been approved; machinery and materials have been ordered. The ground is now being prepared, and the erection of the plant will begin shortly, with the intention of having it in operation before the close of the year. Ore was recently struck in the shaft at a depth of 970 ft., it was still in the vein after having passed through 7 ft. of ore. The shaft will be sunk to a depth of 1050 ft., including the sump, and a station will be cut on the 1000-ft. level, where an electric pump, with capacity of lifting 400 gal. of water per minute to the surface, will be installed. As the water from the lower levels is being drained into the Anaconda company's Belmont workings at present, the pump will not have to be operated at full capacity. A new electrically operated air compressor, capable of compressing 700 cu.ft. of air per minute, is now being installed at the surface. A recent shipment of 50 tons of ore from the 300-ft. level of the vein at the east end of the mine, gave $1825 returns.

Salt Lake City

Aug. 31—Smelting conditions in the Salt Lake valley are normal for this season of the year, and the regular summer business is being done. The amount of ore coming in is somewhat greater than earlier in the year, but is not unusually large for this season. The supply of lead ore coming in is not overabundant. The production of the mines continues steady, and the smelteries are handling all ores offered them. The widening of the field by the International smeltery at Tooele in taking lead ores, is generally conceded as having a good effect on the mining situation. It is making more competition in this particular field, and has caused better rates to be offered.

The furnaces in operation the latter part of August were as follows: The United States Smelting, Refining and Mining Company, at Midvale, was running five furnaces on lead ores, and treating the usual tonnage. The Huff electrostatic zinc plant is running three shifts, treating 50 tons per day of zinc middlings from the wet concentrator. The American Smelting and Refining Company, at Murray, had five lead furnaces in operation, including the furnace for matte concentration, out of a total of eight furnaces. The Garfield copper smeltery of the A. S. & R. is running four or five reverberatories, about its usual capacity, and treating about 2000 tons of ore and concentrates per day. The number of blast furnaces running here is not known, but is probably two or three out of four.

At the International's new plant, at Tooele, between 600 and 700 tons of copper ore per day are being smelted, chiefly from the Utah Consolidated, with concentrates from the South Utah, and dry silicious silver ores from various parts of the State. Lead ore is being sent over the tramway from the Utah Consolidated, and is being stored at the smeltery, awaiting the operation of the lead furnaces, which it is now thought will be ready at the end of the year. When the International decided to enter upon the smelting of lead ores, the original plans were for a lead stack, having a capacity of 250 to 300 tons per day. This was changed later to two furnaces with 500 tons per day capacity, and contracts for lead ores up to this amount are reported to have been signed. Contracts have been made with some of the Cœur d'Alene mines, including the Hecla and Monarch. Lead ores and concentrates are being received from the Daly-Judge at Park City, the Cliff at Ophir, and others. There are about 20,000 tons of silver-lead ores now stockpiled. Good progress is being made in the construction of the two 250-ton lead furnaces, and foundations for a third fur-

nace have been laid. Everything at the lead plant is ready for the structural steel, which is expected to arrive steadily from now on. The third furnace was not decided on until July. The stack has been almost completed, foundations for the ore bins laid, etc. The local offices of the company in Salt Lake City have been moved recently from the Dooly block to the Kearns building.

Birmingham, Ala.

Sept. 4—President Lemoine and other officials and directors of the United States Cast Iron Pipe and Foundry Company spent last week in the South, inspecting their several plants and looking over plans as to certain improvements proposed. The United States company has taken charge of the Dimmick pipe plant at North Birmingham, purchased a few weeks ago, and within a fortnight or so now will be ready to resume operations there. The United States company has big pipe plants at Chattanooga, Tenn., Anniston, Ala., Bessemer, Ala., and now at North Birmingham.

Duluth

Sept. 1—Work on the new plant of the Minnesota Steel Company is being rushed. The American Bridge Company has the contract for the erection of the superstructure, and it is now expected that Jan. 1 will witness the completion of the steel work for 11 of the buildings. The buildings for which steel is expected to be up are the the open-hearth furnaces, open-hearth pouring and charging building, merchants' mill, mixer building, stockhouse, pit furnace, blooming-mill building, blooming-mill engine house, gas-producer building for the reheating furnace, reheating-furnace building and the billet-storage building. It was planned to have the steel work up several weeks ago, but delays of various kinds at the grounds stopped the work for some time. Already nearly 3000 tons of steel are on the ground, much of which is already erected. It is estimated that about 17,000 tons are needed.

As the steel structures are being erected, concrete blocks for the walls will be added and the structures inclosed almost as fast as the superstructure is put up. The work is being rushed as rapidly as possible with the view of having the initial unit of what will be one of the largest steel plants in the world, ready to turn out steel by July 1, 1913. The construction company has two large concrete plants in operation, one turning out the concrete in bulk form for the foundation, and the other making blocks of various sizes and shapes for the buildings. The plant which makes the bulk form is turning out concrete at the rate of 1 cu.yd. per minute, and it is being used as fast as it is made, on the many foundations that are being put in. These foundations are enormous in size, being put from 50 to 60 ft. into the ground and reinforced with wires and steel.

The work on the building of a pumping station and the laying of mains from the river to the plant will be started within a few weeks. The company is going to have its own water system, believing that it will not only be more convenient, but also more economical. The pumping station will be built by the American Bridge Company. The Minnesota Steel Company has about 500 men at work on both day and night crews, while the American Bridge Company is employing about 250.

Globe

Aug. 31—As a result of recent heavy rains in the Tombstone district, the big bridge between Fairbank and Benson, on the line of the El Paso & Southwestern railroad was damaged. The grading was washed away at Land Station and Osborne, but was quickly repaired. Machinery is being received for grading on the Fairbank-Tucson extension of the El Paso & Southwestern railroad. Steam shovels, scrapers, 75 carts and 250 mules have already arrived. Work will be started this week.

There is considerable railroad construction work now going on in Arizona. The work of the Arizona Eastern at North Globe is now completed. The Spreckels railroad, now being built from San Diego to Yuma, will be extended through Tucson to El Paso, to connect with the Frisco system through the proposed San Diego, El Paso & St. Louis railroad, rights-of-way for which have already been secured into El Paso. This line would be free from the snowstorms that periodically tie up the railroads of the north.

It is reported that F. M. Murphy, president of the Arizona, Mexico & Gulf of California railroad, a Santa Fé holding, has stated that work on the extension from Silverbell to Port Lobos, on the Gulf of California, is to be started Sept. 1. The plans call for a 3000-ft. deep-water wharf at Port Lobos. The route has already been surveyed. The completion of this road will give the Santa Fé another tidewater outlet on the Pacific, and on that account the railroad will be able to compete with the Southern Pacific and Kansas City, Mexico & Orient railroads.

Tonopah

Aug. 31—There is considerable excitement in this vicinity, aroused by the strikes of rich ore that have recently been made in a number of the larger mines. The Montana-Tonopah management has made no statement as to the recent strike, but it is the general impression that for the last two weeks development work in an intermediate drift 65 ft. above the 765-ft. level has revealed ore of such grade as to cause no little elation. At the North Star rich ore has been found in a raise from the 915 level. On the 1250-ft. level a drift recently was extended through the Mizpah fault, and a little further beyond cut a body of quartz. Some work has been done on this quartz during the last few days, and assays show unusually rich ore.

Reports are coming in of the discoveries made in the Terrell camp, in Churchill county, 14 miles from Schurz. Within the last three weeks much exploration work has been done. Eleven veins are said to have been discovered on the original location, and sampling shows the ore at surface to be of commercial value. There are 80 men in the camp, and work is being done on the roads to make the camp accessible by automobile from Fallon and Reno. It is stated that George Wingfield has taken a bond on the 25 claims, comprising the original locations made by J. A. Terrell. Development work to test the value of these properties will begin at once.

It is stated that the Taos, Sierra Nevada & San Francisco railroad will pass from Springer through San Juan, Garfield and Iron counties in Utah, through Nevada to Goldfield, thence to San Francisco.

Seventy miles from Goldfield and three miles from Coaldale, three beds of lignite have been discovered. A compressor and other machinery are at the property which will be developed by Pittsburgh men.

Porcupine

Sept. 1—Freight congestion in the camp is being relieved gradually, but not nearly so quickly as would be the case if consignees of merchandise would do all within their power to aid the rapid movement of freight. At present about as many cars are being unloaded every day as arrive; the difficulty is to have the consignees unload their goods from cars that came in some time ago. It is this left-over supply that remains in the cars that is causing a part, at least, of the congestion.

Parral

Aug. 31—The elections in this district were not marked by any disturbance, as was anticipated by many. The ballots were cast without need of calling upon the police or *rurales* to maintain order. Now that the local elections are over, it is thought that work at the mines will be resumed.

The improvements that have been planned for several mills in this district will now be made. A party of Mexico City men are to proceed at once to build a power station to supply the mines and mills of the Minas Nuevas and Santa Barbara districts. It is expected that the Conchos dam will be completed in 1913, and that then there will be plenty of power available for the requirements of all the mines and mills.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

A bonanza discovery of gold ore is reported from the Shoup's Bay district. Grubstaked prospectors from Seattle made the find. The steamer "Senator" reached Seattle from Nome, Aug. 12, with $700,000 in gold bullion. This shipment comes from Nome and the Iditarod. A new strike has been made on the Voegtlin-Aubert properties on the benches opposite 15 and 16 on Goldstream. These properties have already yielded about $900,000, and it is thought this new strike will add considerably more.

Vancouver-Valdez—A new vein has been discovered, in which occurs visible gold. More than $15,000 has been spent in developing this mine and results are said to be satisfactory.

Cliff—The mill building and power plant at this mine were recently destroyed by fire, but will be rebuilt at once. B. F. Millard, Valdez, is president.

Ebner—The tunnel on this property at Juneau is now in over 750 ft., and a large force is at work.

Alaska Treasurer—Operations at this mine are to be resumed in the near future, under the direction of T. E. Harper, Juneau, superintendent.

Redmond—The property has been bonded by Mesenach & Peterson. The mine is 12 miles from Seward and ore will be hauled to the latter place in wagons and shipped from there.

Kenai Star—Arrangements have been made to ship the ore to the Tacoma smeltery. About 500 tons per month will be shipped.

Lindow Creek—Free-milling quartz has been found on this tributary of Bear creek, about 12 miles from Dawson. Some samples contain visible gold.

Arizona

Cochise County

An oilfield has recently been discovered south of Contention, near Tombstone, and many claims have already been filed.

Tombstone Consolidated—At the Contention mine, adjoining the pumping shaft, lessees are beginning to ship low-grade ore to the El Paso, Copper Queen and Calumet & Arizona smelteries, to determine the most advantageous treatment contracts that can be made.

Mascot Copper Company—Officers of the company are now devising plans for putting the mine near Willcox on a producing basis.

Gila County

Live Oak—Churn-drilling operations have been completed and all the drillers discharged.

Miami—A large water-softening plant for boiler water has just been completed.

Southwest Miami Mining Company—A large drill, capable of drilling a 12-in. hole to a depth of 1500 ft., has just been purchased.

Globe Western Copper Company—The main shaft, now 410 ft. deep, will be sunk to a depth of 625 ft. Levels will be opened on the 400-, 500- and 600-ft. levels.

Pima County

Santa Rita Marble and Granite Company—A new machine for sawing granite and marble has been erected at the quarries of this company near Tucson.

Pinal County

Copper Creek—This mine, 13 miles from Mammoth, has been bonded to French and English men for $1,250,000. Development work is to be started at once. The property is equipped with a 100-ton mill. R. R. Sibley is manager.

Ray Consolidated—During July the average quantity of ore milled was 2550 tons; for the first half of August, 2630 tons, this with three sections of the mill in operation. The fourth section should be in operation by this date. The recovery from ore, most of which is being taken from stock piles, is said to be nearly 70 per cent. The equipment at the No. 2 shaft is nearly completed, but it will probably be the first of October before the electric machinery will have been received and installed.

Yavapai County

Pacific Copper Mining Company—W. V. De Camp, the general manager, is at Kansas City conferring with the stockholders with a view of erecting a smeltery, which the development of the mine is now reported to justify.

Yuma County

A. L. Rose and associates, of Los Angeles, have secured 900 acres of placer ground along the Gila river, 20 miles from Yuma. Quenner machines are to be used.

California

Amador County

South Amador—The new 100-h.p. electric motor has been connected with the hoist and the mine is being unwatered.

Argonaut—Repairs have been completed, and 700 ft. of ground between the 1400- and 2100-ft. levels put into good condition. Both skips were immediately put in operation bailing water. The new electric hoist is being connected.

Defender—It is expected that the reopening of this mine, undertaken by Carl C. Forssen last winter, will be completed by other people. Forssen was drowned last winter in the Mokelumne river.

Oneida—Unwatering of this mine is in progress, and surface improvements are nearing completion.

Butte County

Mineral Slide—It is proposed to drive a drainage tunnel in this mine, the water from which can be employed for sluicing the gravel which has been developed by more than 5000 ft. of tunnels and drifts. M. Goodday and L. Cohen, of Magalia are the principal owners.

Carlyle—A tramway is being constructed at this mine at Forbestown to connect the principal orebodies on the north side of the Feather river with the mill on the south side. D. C. Mitchell, superintendent.

Crystal Hill Mining and Development Company—This is a new incorporation with capital stock at $100,000 to develop quartz mines at Coutelenc. The directors are: R. C. Andrus, Coutelenc; F. P. Tuhey, A. F. Jones and Annie M. Townsend, of Oroville.

Eldorado County

Poverty Point—This mine, recently purchased by A. Baring-Gould, manager of the Pacific and Excelsior mines, will be put in order for development. The tunnels will be retimbered and 600 ft. of pipe line built to connect with the compressor. There is a 15-stamp mill on the property.

Greenstone—A new shaft will be sunk at this mine recently bonded by J. R. Partridge.

Oro Fino—W. A. Hooton, superintendent of the Sunrise mine, is in New York raising funds for reopening this mine on which he has a purchase option.

San Diego County

Universal Mining and Development Company—This recent incorporation is developing property in Pine Valley district. The 10-stamp mill may be enlarged to 20 stamps, and a cyanide plant built.

Colorado

GILPIN AND CLEAR CREEK COUNTIES..

Conqueror—A 100-ton mill and cyanide annex is being built by this company.

Santiago—Work at this mine is being resumed after a period of idleness while sampling was being done. All ore will be consigned to the Golden smeltery. D. H. Burlingame is manager.

Waltham Mill—Work is progressing satisfactorily at this mill, recently purchased by the owners of the Little Mattie, and it will soon be in operation.

Jackson Mill—This mill continues its regular output of concentrates. Manager Roller has completed the building of the cyanide plant at the Hudson reduction works. New ore bins are being built.

Combination Mill—The foundations for the new mill are completed and the stamp frames are being put in place. McFarlane & Co. are doing the work.

LAKE COUNTY-LEADVILLE

Lillian—This property in Iowa gulch, for over 30 years a gold producer principally, but in which lead ore was mined in the upper levels, is now producing zinc-carbonate ores. Iowa gulch is far removed from the previously known zinc zone.

Miller—This company, operating in Lackawanna gulch, will soon be in position to treat the ore from the mine, in its own mill. All of the machinery is now on the ground, and the aërial tram from mine to mill should soon be completed and in working order. The 50-stamp mill is nearing completion and by the first week in September should be ready to start. A large tonnage of ore is on hand to be run through the mill.

SAN JUAN DISTRICT

Highland Mary—This old mine, at the head of Cunningham gulch, is once more in the list of San Juan shippers. It is now being operated by lessees. Recently they encountered a vein of gray-copper ore in new ground from which they have shipped the first car.

Cimarron Mining Company—This company has been formed to operate a lease which has been obtained from the Revenue Tunnel Mines Company and the Cimarron group. The lease and bond, which is the basis of this organization, was originally granted by the Revenue company to Henry M. Adkinson, and through his efforts New York and Chicago men have become interested. The claims in this group are the Cimmarron, Bradley, Memphis and Ophir; all have been producers.

TELLER COUNTY—CRIPPLE CREEK

Old Gold—At the annual meeting the stockholders will consider several applications for lease. The officers will demand that the lessee sink the shaft an additional 300 ft. in order to open the C. K. & N. shoot, which is believed to dip through this estate.

Isabella—The mill being operated by the Western Reduction Company, is treating about 2500 tons per month of the tailings from the old mill.

Idaho

Carbonate Hill—The drift from the surface is now in 1250 ft. and a vertical depth of 450 ft. has been attained. The vein has widened from six feet, at the surface, to 18 ft. at the present face. A crew is constructing a flume, which will carry water for power purposes.

Amy and Matchless—A strike made on this group recently shows nine feet of good ore. Three feet of this is clean, shipping galena which will run about 60 per cent lead. The property is situated in the Pine creek district west of Kellog.

King—Suit has been instituted against the Idaho Northern railroad for alleged damage done to two patented claims of the mining company by the building of the railroad and telegraph line.

Indiana

Summit—This mine, near Linton, Greene county, has been closed by order of the State mine inspection department, due to bad air and other faults which endanger the lives of the workmen. It will be closed nearly two months for repairs and overhauling. About 400 men will be thrown out of work.

Indiana Quarries—The company, at its quarries in Lawrence county, is quarrying large blocks of stone that are to be worked up into 33 big columns for the Scottish Rite Cathedral, in Washington, D. C. The Ingalls Stone Company, of Bedford, has the contract to furnish the columns. The blocks of stone as they are taken from the quarry are over 4 ft. 6 in. square and a little over 33 ft. long.

Rainbow—Fire has been discovered in the south half of this mine, at Caledonia, Sullivan county, where nine miners were overcome by blackdamp last week, and a force of men is at work combating the flames, which are likely to be put under control soon. While the fight against the flames is going on in the south part of the mine, 100 or more men are working in the north half of the mine. Mine Inspectors Stewart and Collins say that the fire is believed to have been caused by a match dropped in a pile of gob dust down in the main shaft. The inspectors say that the damp has been eradicated.

Kansas

Boston—It is planned to erect a large mill on the lease at Galena. Five shafts have been sunk into the ore, which is in soft ground. A test mill run is being made. Franklin Playter is manager.

Mess Opencut—The breaking of the flume at Short creek has caused the flooding of this and the Lock Port mine, at Galena.

Michigan

COPPER

Tamarack—The working force at No. 5 shaft has been reduced to a single shift and it is likely that this plan will be put into effect at the other shafts.

Houghton—The crosscut from the 460-ft. level has passed through the lode, showing it to be nearly 20 ft. wide. Drifting on the formation will be started and sinking in the shaft has been resumed.

Isle Royale—The following depths had been obtained at this company's shafts on Aug. 1: No. 4, 1333 ft.; No. 5, 886 ft.; No. 6, 1094 ft.

For the seven months of 1911, ended July 31, the average rock shipments were about 1500 tons per day, yielding 16½ lb. of copper to the ton. Developments at the Houghton Copper Company are of particular significance to this company, as the openings of the Houghton company on what is believed to be the Baltic lode, are within 1000 ft. of this company's boundary. A large amount of exploratory work was done at "A" shaft to open this formation, but all work was discontinued at this point some time ago.

Montana

BUTTE DISTRICT

Alex Scott—For the purpose of inspecting their properties, and of holding a meeting to outline future plans for developing them, a number of the officers and stockholders of the company arrived at Butte, Aug. 29. It was proposed in a meeting, to erect a concentrator. It has been decided to increase the shipments from the present amount of between 40 and 50 tons of ore daily, to 80 tons.

Tuolumne—Daily shipments of between 150 and 200 tons of ore are being made. On the 1600-ft. level drifting has just opened a body of bornite and copper glance. This is the same orebody as opened on the 1400-ft. level, but wider and of higher grade. The face of the drift has been advanced 300 ft. and stoping commenced. The steel building for the new Nordberg hoist is nearly completed and the hoist is being installed; the concrete foundations are laid and the two bed pieces are in place. Excavating is now going on for the foundation of the new steel headframe, and for the ore bins, which will have a capacity of 1000 tons. Ore will be dumped directly from the skips into the ore bins, and from there into the railroad cars on the new spur directly under the bins; this will effect a saving of 60c. per ton on haulage charges.

South Butte—The last suit of the South Butte Mining Company, brought for the purpose of quieting title to a number of

mining claims situated near the Great Northern railroad yards in South Butte, which has been pending in the United States court for some time, was ended in Helena, Aug. 23, when a decree was handed down by Judge Rasche, declaring the plaintiffs to be owners of the ground, and enjoining Henry Crangle and others from further working the property.

JEFFERSON COUNTY

Elkhorn—John Rothfus, of Elkhorn, and the Jacquemins, of Helena, have just leased and bonded the properties of the Gould & Curry Consolidated Mining Company, at Elkhorn, to Montreal capitalists. A payment has already been made and sufficient capital subscribed to operate the property.

LEWIS & CLARK COUNTY

Belmont—In sinking a new shaft on the Belmont claim of Colonel Cruse, in the Marysville district, a vein of rich ore has just been cut.

LINCOLN COUNTY

Keystone—A statement has been made by J. H. Ehlers, of the Lincoln Gold Mining Company, owning the Sylvanite gold mines, the Keystone and the Goldflint, near Troy, that the mines and mill will be in operation before winter. A new 30-stamp mill, the machinery for which has been ordered, will be erected, and $100,000 has been raised to develop the water power at Yakt Falls.

Victor-Empire—At this mine on Granite creek, 12 miles from Libby, a strike of gray copper ore carrying silver has just been made in the tunnel. It is supposed to be the same shoot of ore that the company expected to find as soon as the tunnel was driven underneath the capping which outcrops for 1200 ft. on the top and side of the mountain.

SANDERS COUNTY

Silver Cable—A lower tunnel is being driven to tap the orebody at greater depth. The recent strike shows high-grade galena containing wire silver. The property is situated in the Bryan district near the Idaho line.

Nevada

COMSTOCK LODE

Mexican—The foundations for the new 100-ton mill are now being laid. The lumber for construction has been shipped. The final plans for the mill building, a corrugated-iron structure about 60x150 ft., have been completed. Provisions have been made so that the capacity of the mill can be readily increased from 25 to 50 per cent. at any time. Work has also been started on a new assay office west of the mill. In the mine, work has been resumed, advancing the main north drift on the 2500 level, which is less than 40 ft. from the Union boundary line. Collar sets have been placed in the new inclined winze from that level.

C. & C.—Plans have been completed for the installation of a new centrifugal pump at the 2450 station within the next five months, which will take the place of pumps now in place on that level and on the 2350 station. New pumps will also soon be ordered for the 2650 station, as soon as all the details have been arranged.

Ward Shaft—A second diamond-drill hole has been started in the Gold Hill drainage drift on the 2000 level, about 4 ft. below the first, the latter having failed to tap the water in the old workings as expected, evidently being run out too high. A raise is also being extended in the Julia Consolidated connecting drift, from which it is contemplated sending out diamond-drill holes for drainage purposes..

Ophir—The recovery for the week ended Aug. 26, was $15,000, the ore being stoped from the 2100 and 2200 levels. Low assays are being secured from the new vein being opened on the 2400 level.

Union Shaft—A corrugated-iron storehouse and change room are being built at the surface.

CHURCHILL COUNTY

Pirouette—This company, controlled by Pennsylvania men, proposes installing an electric hoist. The inclined shaft will be sunk to the 500-ft. level. A transmission line will be built to connect with the power plant at Wonder.

LINCOLN COUNTY

Prince Consolidated Mining Company—A mill is to be built at Bullionville wherein tailings from a dump will be treated. Ore is being developed in the Prince mine; shipments, via Panaca, to the International smeltery are being maintained.

Amalgamated Pioche Mines and Smelters—L. Vogelstein & Co., of New York, have under negotiation the control of this corporation, the Day, Bristol Consolidated Mines Company, and the Nevada-Utah Mines and Smelters Corporation.

LYON COUNTY

Mason Valley—Electric current is now being received at Wabuska over the Dayton line for construction work at the smeltery. A fortnight ago four carloads of structural steel arrived. The main power line, now nearly completed, will be 69 miles long.

NYE COUNTY

Belmont Extension—The repairs to the timbers of the Buckeye-Tonopah shaft have been completed. Only a few sets below the collar were damaged by the recent fire.

West End Consolidated—At the company's mill, which is being reconstructed at Midway, all the machinery has arrived and it is now expected that by Sept. 15 the plant will be ready to crush ore.

Buckeye-Belmont—Retimbering the collar of the two-compartment shaft has been completed. A temporary timber headframe will be built at once; later a steel headframe will be erected.

New Mexico

Chino—The fires have been started under the Chino boilers, thus placing the property in the operating class. It is 2¼ years since drilling was inaugurated by the present management and 14 months since construction of the mill started. It is expected that by the middle of the month crushing of ore will have started and that the first section of the mill will be treating ore by Sept, 25.

Vanadium Mines—A contract is reported to have been let for the construction of a $75,000 concentrator for treating vanadium ores at the mines near Cutter, Sierra county.

Boyne—The property east of Bayard station, Grant county, has recently been placed under lease and bond to Colorado men. Work has been commenced by the leasers.

Memphis—Work is being pushed with a force of 14 men under M. J. Daley, general manager. The property is situated near Las Cruces. Development work is being done on the 160-ft. level, and the main shaft is being sunk.

North Carolina

Uwarra—This mine at Candor has been pumped out and an aggressive campaign of development instituted. The Uwarra company is a reorganization of the old Montgomery company. The stamp mill at present on the property will be remodeled into a fine-grinding and cyanide plant or an entirely new plant will be built. Percy E. Barbour is in charge.

Oregon

Mollie Gibson—W. J. Evans, Sumpter, manager, is planning to increase his force and to push development work on this property. Ventilating machinery is now being installed.

Bonanza—Henry Dodson, Sumpter, who is operating this property, recently encountered some good ore, and has made a satisfactory cleanup.

South Dakota

Golden Reward—An order for a Wedge mechanical furnace has been placed by the company. It will be installed in a steel building adjoining the present mill, at Deadwood, and it is the intention to increase the roasting facilities as soon as a thorough demonstration has been made. Fuel oil will be secured from the Casper, Wyo., field. The ore will be dried at the Astoria mine, where it is produced, and shipped by rail to the mill, where it will be roasted and cyanided.

Utah

Juab County

Tintic shipments for the week ended Aug. 18 amounted to 147 cars, those for the week ended Aug. 25, to 149 cars.

Carisa—Some ore is being shipped by the company from development, in addition to what is being sent out by leasers.

Crown Point—Drifting to the west is being done on the 400 level, which point is practically 200 ft. deeper than the main ore channel of the Colorado.

Utah Consolidated of Tintic—In raising from the 200-ft. level below the tunnel, some rock carrying small amounts of copper, gold and silver has been encountered.

King William—Operations at this property have been discontinued again on account of the reported necessity of more generous financing. The company is understood to have demonstrated that the best place for work would be through the Grand Central.

May Day—This company has made a new smelting contract, by which low-grade ores carrying lead, silver and gold can be shipped direct to the smelteries, at the rate of one car per day. An attempt to concentrate this ore, of which there is a large tonnage, was not successful.

Yankee Consolidated—Leasers shipped a car of 34 tons of ore, during the week, which is valued at $1600. There are encouraging indications on the 1700 level. A contract is reported to have been made, by which low-grade ore will be shipped direct to the smeltery. There are about 15,000 tons of this ore on the dump.

Mammoth—Los Angeles men are reported to have examined the tailings and slimes dump of the old Mammoth mill, which contains about 250,000 tons.

Swansea—A station was cut at 950 ft., and was finished during the week. Instead of further sinking, drifting for the vein will be done upon this level. The new electric pump is in place on the 950 and will be put in operation soon.

Salt Lake County

Utah Apex—The orebody which was encountered on the main tunnel level about six months ago is producing a steady tonnage. The length, breadth and thickness of the ore have not been fully determined. The ore occurs in limestone and following it and mining it are being done in preference to making any effort to block out the ground completely by drifts and crosscuts. In doing the above work, however, two or three tons have been exposed for each ton extracted. About 150 tons per day of ore of shipping grade are being sent to the smeltery. The mill is working two shifts, and treating 100 tons and upward per day. The physical condition of the property is as good as at any time in its history.

Ohio Copper—A meeting of several prominent officials was held in Salt Lake City, Aug. 21, including directors N. J. Catrow, F. Augustus Heinze and others. A representative of the Allison banking interests of New York is reported to have been present. The business transacted at the meeting was not made public, but is supposed to have been for the purpose of arranging the sale of the remaining bonds to complete the mill. Arrangements are reported to have been made with Col. E. A. Wall, of Salt Lake City, to install additional crushing machinery, including Wall corrugated and vertical rolls to replace the crushing equipment now in use. This is expected to increase the capacity of the plant and make it possible to bring the mill up to 6000 tons capacity without adding to the present roof space.

South Hecla—A stockholders' meeting will be held, Sept. 5, to consider the question of ratifying the acts of the directors at a meeting held June 22, 1911, authorizing the execution of a contract with James P. Edwards and Norman W. Haire, of Michigan, who are endeavoring to organize a company to take over various Alta properties, among which are the City Rocks Mining Company, the South Hecla and the Grizzly Mining Company. According to the contract, the South Hecla is to transfer its property and property interests to the new corporation in exchange for 120,000 shares of capital stock.

Summitt County

Uintah Treasure Hill—A special stockholders' meeting is called for Sept. 20, for the purpose of dissolution of the company and the distribution of its assets. This company was sold to the Silver King Consolidated for $100,000, the last instalment of which has been paid. This sum distributed among the stockholders will amount to a little more than 10c. per share.

Washington

Montezuma—Some good ore has been struck on this property near Chewelah, and Warner Alexson, owner, expects to be able to make shipments soon.

Republic—The company has just completed a new assay office at Republic, which will be used for its ores after this.

Illinois—This property, near Keller, is being equipped with new machinery, consisting of a gasolene engine, drills, and compressor.

Trade Dollar—Operations at this property are to be enlarged, and some good ore has recently been encountered. J. W. Turner, Republic, is manager.

Black Tail—New machinery is being installed on this property near Republic, and the shaft is to be deepened. This mine is controlled by the Hope Company.

West Virginia

Marsh Creek and Splint Coal Company—This company was organized recently with a directorate including a number of Michigan men, and has leased 2740 acres of land, from the Roland Land Company, lying in the vicinity of Marsh and Clear forks of the Big Coal river. A three-mile railroad spur is under construction, and is to be completed by Dec. 1. The machinery for the mine has been purchased, but the company is in the market for a steel tipple. The coal to be mined is similar in quality to the New River smokeless variety, and has been stated by some experts to be that coal; it is, however, a hard, splint coal.

Canada

British Columbia

The Canada conservation commission has a committee visiting coal mines in British Columbia to ascertain whether modern methods are being used and unnecessary waste avoided in mining coal; also what is done to prevent accidents both above and below ground. The committee is accompanied by W. J. Dick, mining engineer for the commission.

Slocan Star—An amalgamation of the Byron N. White Company's Slocan Star group of mines, in the Slocan mining district, with the much smaller adjoining property of the Star Mining and Milling Company, with which there was litigation concerning extralateral rights over eight or nine years, has been arranged, and a plan of development at greater depth has been recommended by Andrew G. Larson after an exhaustive examination of the property.

Consolidated Mining and Smelting—This company is operating the Le Roi mine in conjunction with its Center Star-War Eagle group of gold-copper mines, at Rossland. In East Kootenay, the St. Eugene and Sullivan are shipping lead ores to the company's smeltery at Trail. Munroe Archibald, one of the company's mining engineers, has been examining mines in the Ainsworth and Slocan districts; among the properties examined is the Payne mine, formerly a large and profitable producer of silver-lead ore.

Ontario

International Nickel—It is reported that the company is negotiating with the Dominion Nickel Company for the purchase of the extensive properties of the latter company situated principally on the north range of the Sudbury district.

Ontario—Cobalt

Nipissing—The refining plant is now in successful operation and the company is treating most of its high-grade ores. It will do all its own refining as soon as an existing contract has expired. Experiments are now being made with a view to the treatment of second-class ore at this

plant, and it is believed that this can be done with a recovery of 90 per cent. of the silver. The estimated saving by the refining of first-class ore is $300,000 per year.

O'Brien—Rich ore is being taken out on this Gowganda property. A carload of 19 tons shipped recently realized over $38,000.

Cobalt Lake—The new concentrator will be in operation in a few days. It will treat about 75 tons per day at the outset, its full capacity being 100 tons. It has 20 stamps with a regrinding mill.

ONTARIO—PORCUPINE

Pearl Lake—The diamond drill has encountered mineralized schist at the 400-ft. level, which is reported to assay $19 per ton.

Dome Extension—A 2-ft. vein of quartz found on the surface near the camp buildings is being stripped and is found to carry good gold contents.

Imperial—A good strike is reported on the northwest corner of the property, where a 5-ft. vein, rich in free gold, has been opened. In drifting on the 100-ft. level a vein 7 ft. wide has been encountered.

Dobie—No. 3 shaft has reached a depth of 50 ft. Stringers running off from the vein and carrying gold have been encountered.

Plenarium—Two shafts, one on the north and the other on the south side of Pearl lake, are being sunk. An 11-drill compressor, a 200-h.p. motor and auxiliary steam plant have been ordered.

Porcupine Reserve—A new vein 35 ft. wide has been uncovered for 500 ft. on the Birke location operated by this company and assays well throughout.

Hollinger—Two new veins have been uncovered on the north lot, both carrying free gold. One of these, varying from 2 to 9 ft. in width, has been traced for 350 ft. The other is 15 ft. wide in one place.

Dome—The 18-in. quartz vein, found in trenching about 600 ft. east of the present workings, has been followed for 72 ft. toward the Dome Extension. The showings of gold are described as of extraordinary richness, the gold appearing in splashes the size of a dime. The discovery has created much excitement. Surface work is being pushed on this portion of the property.

North Dome—A new vein, uncovered for 20 ft., is from 5 to 6 ft. wide between well defined walls. Gold occurs freely.

Swastika—The company recently cut another oreshoot at the 300-ft. level.

Lucky Cross—A good discovery has been made on this Swastika property.

Stoddart—This claim, situated between the Hollinger and the Worthington, has been purchased by the Waters-Harris syndicate, of New York.

Mexico

BAJA CALIFORNIA

Richey Gold Mines and Smelting Company—This is the name of a new Arizona incorporation which holds several options on properties in the San Antonio district. At present the La Colpa property is being developed. Two shafts are being sunk on the main vein and it is the intention of the management to connect these at depth. This property has produced a large quantity of high-grade gold ore.

San Lorenzo—This property lies near those of the Progreso company, and is now producing ore of a grade that can be shipped and milled.

Las Canoas—Leonard Orynski is mining and cyaniding gold ores from his property near Ventana bay and is making a shipment of gold concentrates and gold precipitates. He expects to increase the capacity of his plant.

El Valle Mines Company—The properties of this company are in La Junta cañon and in early days produced good ore. They are being reopened under the management of Mr. Roth, of Los Angeles.

Progreso—This company is operating its mill as usual. Some rich ore has been found in the Humboldt mine.

CHIHUAHUA

Los Remedios—This group of mines is under option to a syndicate of Mexico City and French men. Edmund Girault is making an examination.

Santa Rosalia—Operations at the smeltery will be resumed within 60 days. It is stated that Bernard MacDonald may take charge of the property.

La Republica—In July, 567 tons of ore milled at a cost of 35,846 pesos, yielded 32,861 pesos; 2623 pesos was spent on permanent improvements. An abnormal flow of water in the mine caused a cessation of operations. Further production will be deferred until the water difficulties have been overcome.

Rio Plata—During July, 1769 tons of ore were crushed. In the cyanide plant 1999 tons of tailing was treated. The cost was $12,501, the operating profit, $24,843. In development work, $443 was spent.

Adela Mining Company—A band of robbers made an unsuccessful attempt to steal the pay-roll money at this mine near Roncesvalles.

Cigarrera—Four cars of ore are being shipped daily. The new equipment is now in place and it is said that further improvements are to be made.

Cocheño—The remodeled cyanide plant is to be put in commission about Sept. 1; its capacity is about 30 tons. J. D. Hickey is in charge.

Eureka-Providencia—Work has been resumed at these Parral mines. Edward Putnam is manager.

MEXICO

The Mexican Light and Power Company has finished installing a receiving and transforming station at San Guillermo in the Pachuca district and is now building a new substation at Eguia.

MICHOACAN

Santo Niño—This mine, in the mountains back of the Pacific port of Guagua, recently shipped six tons of high-grade gold-silver ore to the San Luis Potosi smeltery.

SONORA

At Cienega in the Altar district, P. Hansen is working 30 dry washers.

Moctezuma Copper Company—An aërial tramway has been built to carry the mill tailings across the river into the foothills. The tailings were formerly dumped into the river, causing considerable damage to property for a distance of 20 miles.

Cajon Mining Company—This Denver company now controls the Cajon de Amarillas mine and 20-stamp mill in the Altar district, 50 miles west of Llano. W. H. Jenks is manager.

Waldorf—This property, 20 miles south of Moctezuma, formerly owned by B. L. Cosgrove, will be developed by a company of New York men recently organized at Douglas, Ariz., and known as the New York Leasing Company.

Cerro Cobre Development Company—The force of men doing development work in the Tecolote mine, 35 miles east of Carbo, has been increased.

Rey de Oro—At this mine east of Magdalena, formerly owned by the Tribune Mining Company, development work is being done by Roy & Titcomb, of Nogales, the new owners. H. M. Clagett is in charge.

United Mexican Mines Company—A reverberatory furnace is to be built at the Cerro Gordo mine near Cumpas. The foundations have been laid and it is expected that smelting will be commenced within 60 days. O. L. Neer is superintendent.

Cananea Consolidated—A pipe line is being laid between the Henrietta and Puertocitos mines to convey power for the operation of drills at the latter property.

South America

VENEZUELA

A Canadian syndicate has made the first payment to the government of Venezuela on the iron deposits on the Oronoco river. This syndicate is headed by F. P. Jones, manager of the Canada Cement Company, with whom are associated Sir Edward Clousten, vice-president Bank of Montreal; H. S. Holt, president Montreal Light, Heat and Power Company; Sir W. M. Aiken, Montreal and London; E. L. Pease, manager Royal Bank of Canada.

The Markets

Coal Trade Review

New York, Sept. 6—The coal trade in the West is balancing itself on the edge of a change, which operators hope will be for the better. Steam-coal demand is uncertain; for the moment it is not heavy, and manufacturers still hesitate about stocking up ahead. Operators look for an improvement, however, and are preparing for a larger trade. Domestic-coal trade is good, as there seems to be more putting in of winter stocks than is usual so early. Mines in most of the western fields are running at about two-thirds time.

The seaboard bituminous-coal trade is improving in some degree, and operators are looking for better business.

Anthracite trade is quiet and steady, with no departure from the usual season routine.

The heavy rains of last week have brought a good stage of water in the Ohio, and the shipments from Pittsburg by river have been very large.

Coal Traffic Notes

Coal shipments over railroads in the Ohio Coal Traffic Association, six months ended June 30, short tons:

	1910	1911	Changes
Hocking Valley.....	2,058,791	1,458,340	D. 600,451
Toledo & Ohio Cent.	920,649	788,581	D. 132,068
Baltimore & Ohio...	1,153,510	816,380	D. 337,130
Wheeling & L. Erie.	1,813,157	1,502,723	D. 310,434
Cleve., Lorain & Wh.	1,614,757	1,247,488	D. 367,269
Zanesville & Western	599,311	487,217	D. 112,094
Toledo Div., Pen. Co.	1,110,118	932,423	D. 177,695
L. Erie, Alliance & W.	545,471	564,164	I. 18,693
Marietta, Col. & Clev.	50,817	14,112	D. 36,705
Wabash-Pitts. Term.	27,073	36,784	I. 9,711
Kanawha & Mich....	.....	32,666	I. 32,666
Total.....	9,893,654	7,880,878	D.2,012,776

Total decrease this year was 20.8 per cent. Baltimore & Ohio tonnage is of the Ohio lines only; main-line tonnage is given elsewhere.

Bituminous-coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, six months ended June 30, short tons:

	Bituminous	Coke	Total
Pennsylvania.....	19,748,713	5,248,549	24,997,262
Balt. & Ohio.....	13,722,939	1,863,137	15,586,076
Buff., Roch. & Pitts.	3,675,689	189,092	3,864,781
Buff. & Susqueh'na	825,005	152,433	977,438
Penn. lines, N. Y. C.	3,984,769	44,414	4,029,183
Pitts. & L. Erie.....	4,477,946	2,642,363	7,120,309
Pitts..Shawmut & N.	705,865	9,860	715,725
Norfolk & Western.	8,500,377	870,031	9,370,408
Ches. & Ohio.....	6,032,153	75,454	6,107,607
Virginian.....	1,215,682	.....	1,215,682
Total.....	62,889,138	11,095,333	73,984,471
Total, 1910.....	64,515,534	15,230,002	79,745,536

Decrease in coal, 1,626,396 tons; in coke, 4,134,669; total decrease, 5,761,065 tons, or 7.2 per cent. The Chesapeake & Ohio tonnages are for five months only. The Virginian does not report coke tonnage separately. Anthracite tonnages of Pennsylvania and of Baltimore & Ohio are given elsewhere.

Movement of coal on various waterways, six months ended June 30, short tons:

	1910	1911	Changes
Monongahela River, Penn.....	4,936,464	5,107,962	I. 171,498
Great Kanawha, W. V.	735,800	726,920	D. 8,880
Davis Island Dam, O.	1,377,685	1,880,990	I. 503,305
Louisville Falls, Ohio	828,641	968,262	I. 139,621

The movements at Davis Island dam and Louisville Falls canal duplicate each other to a certain extent.

Coastwise coal shipments from chief Atlantic ports, six months ended June 30, long tons:

	Anthracite	Bitum.	Total	PerCt.
New York...	7,856,210	5,233,083	13,089,293	59.0
Philadelphia	1,151,040	2,349,632	3,500,672	15.8
Baltimore....	141,125	2,149,528	2,290 653	10.3
Newp't News	.....	1,361,893	1,361,893	6.3
Norfolk.. ...	.....	1,918,760	1,918,760	8.6
Total.....	9,148,375	13,012,896	22,161,271	100.0
Total, 1910.	8,401,215	12,497,812	20,899,027	.....

Total increase this year, 1,262,244 tons, or 6 per cent. Norfolk includes Sewell's Point. New York covers all the harbor shipping points, including barge shipments from those points to city and neighboring docks.

Coal shipments reported by Southwestern Interstate Coal Operators' Association, five months ended May 31, short tons:

	1910	1911	Changes
Missouri.....	935,776	973,981	I. 38,205
Kansas.....	1,781,375	1,905,828	I. 124,453
Arkansas.....	818,089	532,712	D. 285,377
Oklahoma.....	1,016,294	930,002	D. 86,292
Total.....	4,551,534	4,342,523	D. 209,011

In 1910 there were no shipments in April and May, the mines being closed by the general strike. These shipments include about 90 per cent. of the coal mined in the States named.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

Anthracite

Sept. 6—There has been some talk of dullness, but the tonnage of coal moving is fully up to the average for September. All-rail trade seems to be more active than coastwise business.

Schedule quotations for domestic sizes for September are $4.75 for lump, $5 for egg and stove and $5.25 for chestnut; all f.o.b. New York harbor. For steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.20@2.70; No. 2 buckwheat or rice, $1.75@2.15; barley, $1.40@1.70; all according to quality, f.o.b. New York harbor.

Bituminous

The expected turn in the trade has not come. New York harbor trade is quiet. All-rail trade is only fair. Coastwise business is looking up a little. It will soon be time for the shoalwater ports to busy themselves.

Prices remain about the same. A good quality steam coal costs $2.50, f.o.b. New York harbor; lower grades sell down to $2.30 and better up to $2.85. Gas coals are $1.15@1.20 for ¾-in. and $1.05@1.10 for run-of-mine at mines. Slack is still rather too plentiful; otherwise there is very little free coal at tide.

The West Virginia roads are complaining of a shortage of cars, due to the locking up of many cars in the Lake trade. Unloading at the Lake ports has been delayed, and cars come back slowly.

Stormy and uncertain weather has troubled the Coastwise trade, and vessels are short for the present. Freights are not quotably changed, however. Going rates from New York are 55@60c. to Boston and Portland, with 10 or 15c. more to the shoalwater and towage ports; 35@40c. to Providence and Fall River; 25c. to Sound ports. From Philadelphia to Boston and Portland, 60@70c. is quoted. From Norfolk to Boston, 60@70c. is asked.

Birmingham

Sept. 5—Coal operations in Alabama show improvement and delivery on big orders booked some weeks since has been started on. Alabama coal is going into New Orleans in quantities and will do so for time to come. The railroads in Southern territory are looked to as heavy customers when the crops of the farmers begin moving.

There is plenty of labor at the coal mines. Many miners and mine workers are coming back to the coal section in anticipation of steady occupation through the winter.

The installation of a big coal washer by the Alabama Fuel and Iron Company means an enlarged output at some of the mines of that company. The Tennessee Coal, Iron and Railroad Company has placed some contracts with smaller coal companies in order to get fuel to meet contracts booked a short time back.

The coke demand is fairly good and prices are steady. The make is being improved. It is announced that within two or three months now that more than half of the byproduct coke ovens of the Tennessee Coal, Iron and Railroad Company building at Corey, near Birmingham, will be ready for operation.

Chicago

Sept. 4—A steady market continues for all coal, with a slow increase in the buying of domestic grades and a complaint by many wholesalers that the retailers are putting off buying until the demand comes from their consumers. All coals are in such large supply, with no prospect of scarcity soon, that the tendency naturally is to wait. Steam coals sell fairly well, but there is a larger supply of screenings than the market can readily absorb, and consequently prices remain low after having been high for a year or more. Everything points to a large total business in both steam and domestic grades as soon as September shall start the usual demand for cool-weather needs.

In car lots Illinois and Indiana bring, in Chicago, $1.85@2.35 for lump, $1.75@1.85 for run-of-mine and $1.30@1.50 for screenings. Smokeless West Virginia coal continues in large supply as regards run-of-mine and short supply as to lump and egg, with the former selling at $2.95@3.05 and the latter at $4.05@4.30. Hocking maintains its firm condition, the demand being good and the supply not too great, at $3@3.15. Sales of anthracite are light, with the probability of much congestion in the traffic as soon as the demand caused by need comes.

Cleveland

Sept. 5—Lake coal trade is again more active, as the northwestern docks are being cleared out and there is less delay in unloading. Domestic trade is good, but steam coal is rather slow as yet. There is complaint of car shortage on the West Virginia lines.

Prices are unchanged from last report. Slack is rather in oversupply, and sells in some cases at a small discount.

Indianapolis

Sept. 4—The demand for domestic coal for storing purpose shows a decided improvement. Business conditions, however, are not encouraging for any immediate or extensive sale of steam coal. The demand for coke is so limited as to indicate a dull condition in the iron and steel manufacturing business. But, notwithstanding these and other indications of dull business the coal operators are hopeful of a return of normal business activity which means a corresponding increase of the coal-mining business.

Operators in the bituminous field say they are selling more of their high-grade coal for domestic purposes than usual. Retailers are showing a decided preference for the best grades produced by the Indiana miners. The majority of the mines are working from three to five days a week.

Pittsburg

Sept. 5—Local demand for coal continues fair. A better movement in the Lake trade is expected late in the season when the farmers take coal from the distributing centers as they are moving their crops, the difficulty of late having been the congestion at upper Lake points. Prices are fairly well maintained, and we continue to quote: Nut, $1.10@1.15; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35; slack, 60@75c. per ton at mine. Prices on slack are not infrequently shaded 10c. or more.

Connellsville Coke—We note sale of furnace coke covering 5000 tons for delivery over the next few weeks at $1.50, about 8000 tons for September at about $1.55, and 7000 to 8000 tons for September at $1.60, the last named transaction being in special circumstances which made the price somewhat higher than the market. Odd lots for immediate shipment generally bring $1.50. The labor situation has grown worse and is quite unsatisfactory, promising trouble if it becomes necessary to fire more ovens. Prices are fully expected to be higher during the last two or three months of the year, and contracts for fourth quarter cannot be made at less than $1.70, most sellers asking $1.75 or $1.80. We quote: Prompt furnace, $1.50@1.55; contracts over last three months, $1.70@1.75; prompt foundry, $1.85@2; contract foundry, $2@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Aug. 26 at 332,157 tons, an increase of 18,000 tons, and shipments at 3906 cars to Pittsburg, 4851 cars to points west and 852 cars to points east, a total of 9609 cars.

St. Louis

Sept. 4—The coal market since Sept. 1 has received a considerable impetus all along the line from the dealers' business. Prices have advanced on domestic coals and the higher grades are in excellent demand, with mines all behind with shipments. Not only has the buying of the trade direct been free, but jobbers also have been in the market placing large speculative orders, which probably makes the market seem to the operator even stiffer than actual trade conditions will warrant.

All the firms in the Carterville district have advanced the price to $1.50 per ton at mines for lump and egg, and $1.25 for nut. Lump is strong at that price, though egg can be shaded from 10 or 15c. Business by St. Louis coal firms in the Northwest is greatly in excess of any preceding year.

Standard coal, which forms the bulk of tonnage moving from St. Louis proper, has also advanced slightly, but has not yet felt the impetus of the southern Illinois mines, largely on account of the tremendous quantities produced.

The reports of the St. Louis Coal Traffic Bureau shows the August tonnage to be large; 610,979 tons were brought in during the first 30 days of the month. The statement for the entire month has not yet been issued, but is estimated will go over 650,000 tons.

Anthracite—The market is firm, and more business has been done during the past week than during the two months preceding.

Current prices are as follows in the St. Louis markets:

Standard:	F.O.B. Mine	F.O.B. St.Louis
6-inch lump	$1.10	$1.62
2-inch lump	0.90	1.42
2 inch nut	0.70	1.22
2-inch screenings	0.35	0.87
Mt. Olive, Staunton, Springfield:		
6-inch lump	1.40	1.92
2-inch lump	1.25	1.77
2-inch screenings	0.40	0.87
Trenton:		
6-inch lump or egg	1.90	2.42
3-inch nut	1.50	2.02
Carterville:		
6-inch lump or egg	1.50	2.17
3-inch nut	1.30	1.97
2-inch screenings	0.50	1.17
Franklin County:		
6-inch lump	1.50	2.17
3-inch nut	1.40	2.07
Anthracite:		
Chestnut		7.20
Stove or egg		6.95
Grate		6.70
Smokeless:		
Lump or egg	2.00	4.50
Mine-run	1.10	3.60

Prices on Illinois soft coal for E. St. Louis, Madison or Granite City, Illinois, are 20c. per ton less than St. Louis

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal from United States ports, with coal furnished to steamships in foreign trade, seven months ended July 31, long tons:

	1910	1911	Changes
Anthracite	1,769,825	1,986,431	I. 216,606
Bituminous	5,733,302	7,039,969	I. 1,306,667
Total exports	7,503,127	9,026,400	I. 1,523,273
Steamer coal	3,791,819	3,834,927	I. 43,108
Total	11,294,946	12,861,327	I. 1,566,381
Coke	508,859	576,581	I. 67,722

Canada took this year 7,091,809 tons of coal, or 78.6 per cent. of the total, Cuba and the West Indies took 888,675 tons of coal. The coke went chiefly to Canada and Mexico.

United States Coal Imports—Imports of bituminous coal and coke into the United States, seven months ended July 31, long tons:

	1910	1911	Changes
Bituminous	1,081,519	755,301	D. 326,218
Coke	65,181	49,225	D. 15,956
Total	1,146,700	804,526	D. 342,174

The decrease in imports was largely due to the strike in Alberta and British Columbia. Anthracite imports are not reported; they amount to only a few tons. Canada supplied this year 618,807 tons of coal and nearly all the coke; Australia, 121,955 tons coal; Japan, 25,021 tons of coal. Imports are chiefly on the Pacific Coast and in the border States of the Northwest.

IRON·TRADE·REVIEW

New York, Sept. 6—The iron and steel trades are showing some improvement in volume of business. The controlled market seems to have passed for the present, and there is no longer any secret of concessions in price made to secure business.

In finished material there has been a good volume of orders in many lines, structural steel still being the leader. Fabricating companies are taking orders on a basis of 1.36c. tidewater for the steel, equal to 1.20c., Pittsburg, while the nominal price is still 1.35c., Pittsburg. Similar cuts are made in plates, sheets, wire and bars. In most lines competition for orders is sharp.

In pig iron there is quite a demand for basic pig both in the East and in the Central West. In seaboard territory there are many inquiries for foundry iron, and a good deal of discussion over prices. Buyers are not disposed to pay advances, while makers are slow to concede present quotations for 1912 delivery. Southern iron is again being pressed for sale.

Panama Scrap—Eleven bids were opened at Washington, Sept. 6, for the old French scrap in the Canal Zone. The higher bids were from the Chicago House Wrecking Company, of Chicago, and the Phoenix Iron and Steel Company, of Calveston, Tex. Bids ranged from $215,000 up to $700,000 for the total.

Baltimore

Sept. 5—Exports for the week included 698,706 lb. miscellaneous iron and steel to Panama; 14,620 lb. chrome ore to Havre, France; 4,367,850 lb. steel rails and 211,230 lb. rail fastenings to Tampico, Mexico. Imports for the week included 590 tons of manganese ore from Rotterdam and 4800 tons from Vizigapatam, India; 10,550 tons iron ore from Cuba.

Birmingham

Sept. 5—Pig-iron manufacturers in the Southern territory are confident that the new month is going to be a good one. The last week in August was not up to the expected average, either as to volume of business or firmness of price. No. 2 foundry iron, for delivery during the balance of the year, is being held at $10@10.50 per ton, with the latter price nearer that procured. There has been a reduction of the accumulated stocks of iron in the Southern territory but not as much as desired. Reports that the make is to be increased materially cannot be verified, though work of repairing on some furnaces is being rushed. Some inquiries are being received for iron for next year and a few sales have been reported, on a basis of $11 per ton, No. 2 foundry.

Cast-iron pipe activities continue. The shipments of pipe from this section of the country are in large lots. The steel production in the South shows little change, the general conditions being fairly good. Charcoal iron is a little slow this week but prices remain around $22.50. The scrap-iron market in the South shows no improvement.

Chicago

Sept. 4—Sales of pig iron continue light and widely distributed, the average foundry melter being still inclined to the policy of buying in small lots frequently. The total of sales has probably increased over last week's record, but there is no general movement to buy heavily anywhere, though inquiries are more numerous. Sales of No. 2 Southern foundry are made at $10@10.50, Birmingham, or $14.35@14.85, Chicago, and of Northern No. 2 at $14.50@14.75, with the business fairly well divided between Northern and Southern. Most sales are yet for the last quarter, but an increasing number run over into the first quarter and first half of 1912. As a whole the market seems to be holding well its own from week to week and both buyers and sellers are in a waiting mood. Local production has been adjusted to the demand so that there is little anxiety to sell; agents of Southern say they can hold out against inaction. The revival of general business customary in September has already begun in many lines, and in the sale of iron and steel products there is continued activity, notably in structural materials and railroad supplies. Coke is rather quiet at $4.60, Chicago.

Cleveland

Sept. 4—Lake ore shipments are dragging. All the business is being done by the company boats, and there is no show at all for wild tonnage. September shipments will be fair.

Pig Iron—Now business comes in slowly, though there are a number of inquiries about. Shipments on contracts are improving. Nearly all buyers want early deliveries, but they are not taking large lots, and are holding back on future deliveries.

Finished Material—There is considerable buying—chiefly in a small way. There is also shading of prices on most kinds of material, chiefly on bars, sheets and plates. This cutting extends to nails, bolts and other small building material.

Philadelphia

Sept. 6—A larger movement in pig iron has set in within a week and quite a few good-sized contracts have been placed for forward delivery. Prices have not quotably changed excepting in two or three cases. Buyers are still suspicious of the future and are purchasing for immediate requirements. The inquiries that have been received within a few days are from the larger consumers mostly, and they have reference to deliveries extending into the winter. Southern iron has again stolen the march and has found its way into a number of localities. Quotations are $15 for No. 2 X and $14.50 for Southern No. 2. Gray forge is $14@14.50; basic, $15, and low-phosphorus irons $20 per ton.

Steel Billets—Supplies of billets in consumers' hands have fallen rather low. Quotations for open-hearth billets are $23.40, tidewater.

Bars—Bars are still gaining a trifle, the store distribution being quite active.

Sheets—In a large way sheets can be shaded. The only business traced up is in small lots.

Pipes and Tubes—Greater activity is reported in all lines. Quotations are now strictly adhered to. Merchant pipe continues dull.

Plates—Heavy business is reported in all mills. Large orders have been booked for a fair quantity of bridge, shipyard and engineering work. The mills are filling up and the inquiries received denote an improvement in demand.

Structural Material—A large amount of business has been placed by the Government, and inquiries now coming to hand for all lines of structural work would seem to indicate a close approach to maximum capacity, although this view is not entertained generally.

Scrap—This week witnesses the scale of immense quantities of scrap at Panama, covering all sorts of refuse material. Local scrap dealers are much interested in the outcome and interest in local scrap matters has died out.

Pittsburg

Sept. 5—The general tone of the iron and steel market is slightly worse again, the feeling being less optimistic, based on actual market results from day to day, although optimistic predictions are still made in most quarters.

In finished steel products there is little new buying. In many lines there is little occasion for it, buyers having placed contracts liberally, and it is the specifications against these contracts which have been disappointing. Mill operations are practically unchanged. There have been no important increases in the past fortnight, but the increased gait attained by the improvement late in July and early in August is maintained. The question is how long this can be maintained.

Irregularities have entered the merchant pipe market, one producer, relatively a new one, giving an extra 2½ per cent. in order to attract business. Some producers have met the cut, while others have refused to do so. The trade is operating under a system instituted Aug. 16 by the National Tube Company, which guaranteed prices against its own declines, announced at any time up to Oct. 1, on shipments for stock during 60 days preceding the reduction. Independents in turn gave guarantees against a decline by the National, each adding a guarantee against his own decline.

The reduced wire prices reported last week, to a basis of $1.65 for nails, are being well held, except that there is occasional cutting of $1 a ton in Southern territory.

Pig Iron—The pig-iron market has been quiet, superficially, but there has been a fair tonnage of foundry, consumers generally buying from their usual sources without putting out formal inquiries. Thus the local sales office of a large interest has sold fully 20,000 tons of foundry, forge and malleable during August, in Pittsburg and Wheeling territory, which is a good record for this interest in normal times. Steel-making iron has been very quiet. Prices are unchanged, and seem to be well held: Bessemer, $15; basic, $13; No. 2 foundry, $13.50; forge, $13; malleable, $13.25@13.50, all at Valley furnaces, 90c. higher delivered Pittsburg. The Bessemer and basic averages, compiled by a trade interest from actual sales, are announced for August at $15 and $13 respectively, Valley furnaces, the same as for July.

Ferromanganese—The market has been quiet, consumers not caring to take hold for forward delivery and being well covered for the present. Prices are unchanged, at $37, Baltimore, for extended delivery, with $36.75 or $36.50, Baltimore, possible on odd lots for early delivery.

Steel—The market continues quiet as regards fresh sales, but deliveries on contracts are as good as formerly. We continue to quote: Billets, $21; sheet bars, $22, f.o.b. maker's mill, Pittsburg or Youngstown; wire rods, $27, Pittsburg.

Sheets—The market continues irregular and there is somewhat more shading on galvanized. Black sheets, 28 gage, can be done at 1.90c. for attractive orders, delivery over balance of year, less attractive orders going at 1.95c. Galvanized sheets can be had on the basis of 2.90c. for delivery over 60 days, from some mills, more extended deliveries or less desirable specifications commanding 2.95c. to 3c. Blue annealed sheets are 1.45@1.50c. for No. 10 gage. Corrugated roofing is quotable at $1.35@1.40 per square for painted and $2.50@2.55 for galvanized.

St. Louis

Sept. 4—The iron market still shows a slight improvement and a number of fair contracts have been placed in the last week. Prices have also improved, as there does not seem to be any $10 iron on the market; $10.25@10.50 Birmingham, or $14@14.25 St. Louis being the best quotation on No. 2 foundry for immediate or first-quarter delivery.

Iron Ore Markets

Shipments of iron ore from the Lake Superior region for July were 5,221,373 tons. For the season to Aug. 1 the shipments were, in long tons:

Port:	1910	1911	Changes
Escanaba	2,464,859	1,711,806	D. 753,053
Marquette	1,723,877	843,177	D. 880,700
Ashland	2,233,864	1,102,263	D. 1,131,601
Superior	3,895,303	4,698,855	I. 803,552
Duluth	7,441,488	3,158,450	D. 4,283,038
Two Harbors	4,104,158	2,549,740	D. 1,554,418
Total	21,863,549	14,064,291	D. 7,799,258

The increase from Superior, alone of all the ports, indicates that the Steel Corporation is working actively on its Hill leases.

Sault Ste. Marie Canal Traffic

The total movement of freight through the Sault Ste. Marie canals for the season to Aug. 1 was 30,302,244 short tons in 1910, and 22,939,511 in 1911; a decrease of 7,362,733 tons. The number of vessel passages this year was 8088, showing an average cargo of 2836 tons. The mineral freights included in the totals were, in short tons, except salt, which is given in barrels:

	1910	1911	Changes
Coal	6,240,500	6,838,023	I. 597,523
Iron ore	21,096,034	13,412,646	D. 7,683,388
Pig and mfd. iron	228,346	196,615	D. 31,731
Copper	58,025	55,860	D. 2,165
Building stone	1,877	3,142	I. 1,265
Salt, bbl.	324,704	303,043	D. 21,661

Iron ore was 58.5 per cent. of the total freight this year, and coal 29.8 per cent.

FOREIGN IRON TRADE

German Iron Production—The German Iron and Steel Union reports the make of pig iron in Germany in June at 1,262,997 tons, being 49,258 tons less than in May. For the half-year ended June 30 the total was, in metric tons:

	1910	1911	Changes
Foundry iron	1,394,246	1,534,883	I. 140,637
Forge iron	331,068	279,293	D. 51,775
Steel pig	643,359	850,423	I. 207,064
Bessemer pig	252,210	169,325	D. 82,885
Thomas(basic)pig	4,581,149	4,848,715	I. 267,566
Total	7,202,032	7,682,639	I. 480,607

Total increase this year was 6.7 per cent. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

METAL MARKETS

New York, Sept. 6—The metal markets have shown little change. The antimony syndicate has practically dissolved, as had been expected for some weeks.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
July 1911	$2,178,088	$ 2,594,653	Imp.$ 416,565
" 1910	828,451	10,282,649	Imp. 9,354,198
Year 1911	15,429,650	36,367,679	Imp. 20,938,029
" 1910	50,345,182	29,671,180	Exp. 20,674,002
Silver:			
July 1911	5,275,008	3,920,794	Exp. 1,354,214
" 1910	5,124,471	3,794,888	Exp. 1,329,583
Year 1911	39,718,211	25,881,395	Exp. 13,836,816
" 1910	32,178,689	25,696,408	Exp. 6,482,281

Exports from the port of New York, week ended Sept. 2: Gold, $60,000, to Dutch Guiana; silver, $1,055,334, chiefly to London. Imports: Gold, $496,081; silver, $152,025, both principally from Mexico and the West Indies.

Gold—Prices on the open market in London were unchanged at 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. There was no special demand and nearly all the supplies arriving went to the Bank of England.

Platinum—The market is quiet, but firm, and prices are unchanged. Dealers ask $45 per oz. for refined platinum, and $47.50 per oz. for hard metal, 10 per cent. iridium.

Silver—The price improved this week, rising to 24¼d. in London on more favorable monsoon reports from India, rain having fallen in parts where most needed. Both India and China have been moderate buyers, but China on some days has been a seller as well. It is too early yet to estimate the condition of crops in China. The immediate outlook is for silver prices to remain at about present level.

SILVER AND STERLING EXCHANGE

Aug.-Sept.	31	1	2	4	5	6
New York	52¼	52⅜	52½	.....	52⅜	52⅜
London	24⅛	24 3/16	24⅛	24 3/16	24 3/16	24 3/16
Sterling Ex.	4.8600	4.8600	4.8600	.....	4.8600	4.8605

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, from Jan. 1 to Aug. 24, reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India	£4,142,500	£5,100,600	I. £ 958,100
China	1,113,500	890,400	D. 223,100
Total	£5,256,000	£5,991,000	I. £735,000

The strikes in London interfered seriously with shipments during the week.

Copper, Tin, Lead and Zinc

NEW YORK

Aug.-Sept.	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
31	12⅛ @12⅝	12.30 @12.35	42½	4.50	4.37½ @4.40	5.85 @5.90	5.70 @5.75
1	12⅛ @12⅝	12.30 @12.35	42	4.50	4.35 @4.40	5.85 @5.90	5.70 @5.75
2	12⅛ @12⅝	12.30 @12.35	42	4.50	4.35 @4.40	5.85 @5.90	5.70 @5.75
4	.....	.....	....	....	.....	.....	.....
5	12⅛ @12⅝	12.30 @12.35	40¾	4.50	4.35 @4.40	5.85 @5.90	5.70 @5.75
6	12⅛ @12⅝	12.30 @12.35	41¼	4.50	4.35 @4.40	5.85 @5.90	5.70 @5.75

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The week has been altogether uneventful. Some orders are being placed right along both by domestic and Eu-

LONDON

Aug.-Sep.	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
	Spot	3 Mos	Best Sel'td	Spot	3 Mos		
31	56 1/16	56 1/16	60 1/4	189 3/4	187	14 5/16	27 1/2
1	56 1/8	56 3/4	60 1/4	189 7/8	186 5/8	14 5/16	27 5/8
2	.....	.....	.....	.....	.....	.....	.....
4	55 15/16	56 1/16	60	188	185	14 7/16	27 5/8
5	56	56 3/8	59 3/4	186	184 1/4	14 7/16	27 5/8
6	56	56 1/16	59 3/4	187	185 1/4	14 7/16	27 5/8

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.40c. ± £1 = ± 0.21¾c.

ropean buyers, but the volume of business has been relatively small, perhaps due to the fact that the trade at large is awaiting the figures of the Producers' Association, which will be published next Friday. In the meanwhile electrolytic copper is liberally offered at 12½c., usual terms. The close is unchanged at 12½@12⅝c. for Lake copper, and 12.30@12.35c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12@12¼ cents.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill.

The standard market has been as uninteresting an affair this week as it was last week. Quotations have hardly moved, the close being uncertain at £56 for spot, and £56 13s. 9d. for three months.

Exports of copper from New York for the week were 7659 long tons. Our special correspondent gives the exports from Baltimore for the week at 4049 tons.

The Mansfeld company, Germany, produced 10,487,543 kg. of refined copper in the first six months of 1911, against 9,522,532 kg. in the corresponding period last year.

Tin—The London market ruled steady until Sept. 4, when it suddenly became weak, declining about £4 for spot and £2 7s. 6d. for futures from its closing on the previous Friday—the last business day prior to the American holidays. This weakness was ascribed to the statistics published on Sept. 1 by the New York Metal Exchange, which showed a decrease in stocks of but 100 tons, instead of the generally expected 1000 tons. The close, however, is firmer at £187 for spot, and £185 5s. for three months.

The premium for spot tin here at one time had almost entirely disappeared, but as there is no tin in stock outside of that belonging to consumers, it has again increased, and is now about ¾c. Business has not been very active. At the close spot is quoted at about 42c., while September tin can be bought at about 41¼ cents.

Visible stocks of tin on Aug. 31 are reported as follows, including tin afloat: London, 11,759; Holland, 720; United States, excluding Pacific ports, 4140; total, 16,619 long tons. This is a decrease of 88 tons from July 31; and a decrease of 1324 tons from the Aug. 31, 1910, report.

Lead—The market at New York is unchanged at 4½c. At St. Louis there is a little more pressure due to larger offerings on part of Missouri producers, and the close there is somewhat easier at 4.35@4.40c., St. Louis.

The foreign market is very firm, and prices are again higher at £14 8s. 9d. for Spanish lead, and £14 11s. 3d. for English.

Spelter—The general character of the market has not changed. Very little spelter is available for early shipment, and consumers are not yet prepared to take hold of futures. The close is unchanged at 5.70@5.75c., St. Louis, and 5.85@5.90c., New York.

The foreign market is somewhat easier, quotations being £27 12s. 6d. for good ordinaries, and £27 17s. 6d. for specials.

Zinc dust is quoted at 7½c. per lb., New York delivery.

Base price of zinc sheets is $8 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of Aug. 26, that prices have continued to advance. Quotations for September are 55.75 marks per 100 kg., f.o.b. works —equal to 6.02c. per lb.— for ordinary brands; 1 mark higher for specials. Zinc sheets are quoted 62.35@64.35 marks per 100 kg.—average, 6.84c. per lb. at works for ordinary sizes. Zinc dust is 52 marks per 100 kg.—5.61c. per lb.—delivered at Stettin.

Other Metals

Aluminum—Sales have been rather slow and prices are inclined to be weaker. The current quotation is 19¾c. per lb. for No. 1 ingots, New York.

Antimony—The market remains quiet, with only moderate sales. Quotations are unchanged at 8.25@8.37½c. for Cookson's; 7.75@8c. per lb. for Hallett's; 7.25@7.50c. for Hungarian, Chinese and other outside brands.

Quicksilver—Business is good, with a fair demand. Prices have receded slightly, the New York quotation being $47.50 per flask of 75 lb., with the usual advances for smaller quantities. San Francisco, $47 for domestic orders and $44.50 for export. The London price has dropped 7s. 6d., and is now £8 12s. 6d. per flask, with £8 10s. quoted from second hands.

Bismuth—The syndicate which controls the European production quotes 7s. 6d.—equal to $1.80—per lb. in London. In New York a quotation of $1.72 per lb. is made for metal produced from American ores.

Cadmium—The last quotation was 700@725 marks per 100 kg.—75.5@78.3c. per lb.—at works in Germany, according to quantity.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, seven months ended July 31, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports	Exports	Excess
Copper, long tons	87,408	45,632 Imp.	41,776
Copper, 1910....	74,494	46,997 Imp.	27,497
Tin, long tons....	25,868	26,733 Exp.	865
Tin, 1910.....	23,630	25,027 Exp.	1,397
Lead, long tons..	129,476	26,393 Imp.	103,083
Lead, 1910.....	126,150	28,429 Imp.	97,721
Spelter, l'g tons..	76,822	5,965 Imp.	70,857
Spelter, 1910....	71,180	5,384 Imp.	65,796
Quicksilver, lb...	3,098,840	1,716,214 Imp.	1,382,626
Quicksilver, '10	3,214,200	700,902 Imp.	2,513,298
Minor met's, tons	3,264	12,612 Exp.	9,348
Minor, 1910.....	3,042	14,007 Exp.	10,965
Ores:			
Tin ore and con.	17,683	..... Imp.	17,683
Tin ore, 1910...	15,420	..... Imp.	15,420
Pyrites	553,619	..... Imp.	553,619
Pyrites, 1910...	464,920	..... Imp.	464,920

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Miscellaneous metals include nickel, aluminum and the minor metals and alloys. Of the imports in 1911, the United States furnished in all 30,028 tons fine copper, and 26,789 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., Sept. 2—The base price paid this week for 60 per cent. zinc ore was $43@44. The base price paid for 80 per cent. lead ore was $58@59 per ton.

SHIPMENTS, WEEK ENDED SEPT. 2

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	596,600	.....	.....
Platteville.....	408,480	.....	455,000
Benton.....	333,070	.....	119,200
Highland.....	231,000	.....	.....
Hazel Green.....	226,900	.....	.....
Harker.....	166,280	217,050	.....
Galena.....	160,000	.....	.....
Monfort.....	60,000	.....	.....
Cuba City.....	59,000	.....	86,000
Total.....	2,241,330	217,050	660,200
Year to date.....	102,661,629	5,708,675	21,470,050

Shipped during week to separating plants, 2,054,090 lb. zinc ore.

Joplin, Mo., Sept. 2—The highest price paid for zinc sulphide ore was $48, the base price of 60 per cent. zinc ranging from $42 to $45. Zinc silicate sold on a base of $23@25 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $43.52. The highest price reported paid for lead ore on a flat bid

was $61, and the average price, all grades of lead, was $60.46 per ton.

Last week and this week the Edgar Zinc Company made purchases aggregating 3000 tons, approximately 1000 tons of which was shipped this week, practically securing all ore not being held for an advancing market. On account of the reflex action of the spelter market other smeltermen appeared loath to meet the price and have generally bought lightly the past two weeks. The American Zinc, Lead and Smelting Company being still out of the market, the ore contracted to that company has been divided around among the various smelters, and when this company resumes shipping its contract ore it may be found that the little reserve ore in the district will be wholly inadequate to meet the demands. It is this assumption upon which the Edgar company is doubtless operating in making such heavy purchases at this time.

SHIPMENTS, WEEK ENDED SEPT. 2

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	3,272,020	.....	903,590	$99,542
Joplin	2,165,910	.....	301,710	56,700
Galena	592,240	63,280	179,200	19,444
Alba-Neck	729,610	.....	36,100	17,863
Granby	440,100	396,770	14,410	15,160
Jackson	539,630	.....	.....	11,872
Miami	361,770	.....	88,490	9,211
Duenweg	356,130	45,510	.....	8,425
Spurgeon	.....	269,570	71,720	6,194
Badger	138,080	.....	10,290	3,208
Sarcoxie	127,000	.....	10,260	3,036
Cave Springs	125,570	.....	.....	2,888
Oronogo	56,110	.....	53,530	2,462
Carl Junction	64,580	.....	.....	1,549
Aurora	64,090	.....	.....	1,410
Quapaw	65,400	.....	.....	1,308
Carthage	59,260	.....	.....	1,244
Totals	9,157,500	774,130	1,669,300	$261,516

35 weeks... 335,929,999 23,098,610 59,640,530 $8,613,677
Blende val., the week, $199,311; 35 weeks, $6,647,040
Calamine, the week, 11,728; 35 weeks, 373,410
Lead value, the week, 50,477; 35 weeks, $1,693,227

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.57
April	41.00	38.88	39.33	37.47	49.72	56.37
May	40.19	38.25	37.51	36.79	48.16	55.21
June	40.20	40.50	37.83	38.18	48.80	56.49
July	39.63	40.75	36.80	38.36	48.59	58.81
August	40.13	42.50	37.32	41.28	49.75	60.74
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Japanese Ore

Production of ores reported in Japan for the year 1910 included 5496 tons manganese ore, a decrease of 3351 tons as compared with 1909; 50,097 tons copper ore, an increase of 4256 tons; 50,667 tons iron pyrites, an increase of 29,156 tons.

CHEMICALS

New York, Sept. 6—The general market begins to show some recovery from summer quiet, but is not yet specially active in most lines.

Copper Sulphate—Business has been moderate only. Prices are unchanged at $4.50 per 100 lb. for carload lots and $4.75 per 100 lb. for smaller parcels.

Arsenic—Business has been rather active and the market is firmer, with prospects of a good trade. While arsenic commands $2 per 100 lb. for spot lots, while an advance over recent quotations, $1.87½ per 100 lb., is asked for futures.

Nitrate of Soda—Business in this article is good and prices have again advanced; 2.20c. per lb. being asked for spot nitrate, and 2.22½c. per lb. for future deliveries.

Petroleum

The Oil City *Derrick* reports the number of producing oil wells completed in August as follows, by districts: Pennsylvania-New York, 440; Lima-Indiana, 57; Kentucky, 10; Illinois, 146; Kansas-Oklahoma, 296; total, 949. At the close of August there were 1177 new wells under the drill.

MINING STOCKS $

New York, Sept. 6—The general stock market was dull, irregular and inclined to weakness. The dullness was increased by the three days holiday, the Exchange having adjourned from Friday over to Tuesday.

On the Curb also the general tendency was irregular, with some inclination to lower prices. Copper stocks were not much in demand. Cobalt shares were the strongest of any, but dealings were not at all heavy. On the whole the week was a dead one.

Boston, Sept. 5—The market for copper shares shows a distinctly improved tone and urgent liquidation has ceased. What more selling is necessary will find buyers, for it is felt that the worst has been seen. The wholesale slaughter of prices has brought many bargains in copper shares and people with money have taken advantage of the situation to gather in stocks at low prices.

It is felt that certain interests took advantage of conditions and precipitated the decline to a point further than was necessary. The apparent failure of the proposed Calumet & Hecla merger has called attention to some of the subsidiary stocks, and there has been marked strength in them. Allouez, for instance, has advanced, as have Centennial, Osceola, Superior and Isle Royale.

The report of Expert Finlay on Michigan mines is thought to have done considerable injustice, for it is felt by many that he was unduly severe in some of his deductions. This report coming at a time when the market was in a strained condition anyway, facilitated the making of low quotations.

Other stocks to show recoveries are Calumet & Arizona, Copper Range, Mass,

COPPER PRODUCTION REPORTS
Copper contents of blister copper, in pounds

Company	June	July	August
Alaska shipments	1,773,300	.....	.....
Anaconda	21,850,000	21,900,000	22,500,000
Arizona, Ltd	2,700,000	2,750,000	.....
Balaklala	.....	.....	.....
Copper Queen	7,088,862	6,373,062	.....
Calumet & Ariz	3,656,000	4,394,000	4,650,000
Detroit	1,732,692	1,590,357	.....
East Butte	841,200	.....	.....
Mammoth	.....	1,598,082	.....
Nevada Con	5,307,400	5,258,582	.....
Old Dominion	1,907,000	2,114,000	.....
Shannon	1,098,000	1,150,000	1,442,560
South Utah	158,661	254,462	.....
United Verde*	3,000,000	3,000,000	.....
Utah Copper Co	7,908,685	7,555,407	.....
Lake Superior*	19,800,000	17,000,000	.....
Non-rep. mines*	12,851,700	16,800,000	.....
Total production	91,673,500	.....	.....
Imports, bars, etc.	22,348,964	20,999,078	.....
Total blister	114,022,464	.....	.....
Imp. in ore & matte	4,744,912	4,205,940	.....
Total	119,767,376	.....	.....
Brit. Col. Cos.:			
British Col. Copper	.....	.....	.....
Granby	.....	.....	.....
Mexican Cos.:			
Boleo	2,315,040	1,973,680	.....
Cananea	3,462,000	3,994,000	.....
Moctezuma	2,071,960	2,340,404	.....
Other Foreign:			
Cape Cop., S. Africa	.....	.....	.....
Spassky, Russia	542,080	672,000	.....
Exports from:			
Chile	3,960,000	7,168,000	.....
Australia	7,168,000	7,056,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.
*Estimated.

STATISTICS OF COPPER

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export
VIII, 1910	127,803,618	67,731,271	61,831,780
IX	119,519,983	64,501,018	75,106,496
X	126,469,284	67,814,172	68,186,912
XI	119,353,463	60,801,992	67,424,316
XII	123,389,219	43,594,018	88,104,075
Year 1910	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II	109,828,297	50,518,998	45,111,019
III	130,532,080	66,080,789	59,081,127
IV	118,085,223	52,407,650	62,129,599
V	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	.....	.....	.....

VISIBLE STOCKS.

	United States.	Europe.	Total.
IX, 1910	168,881,245	218,444,800	387,326,046
X	148,793,714	211,276,800	360,070,519
XI	139,261,914	198,060,800	337,322,711
XII	130,389,069	193,200,000	323,589,095
I, 1911	122,030,195	236,629,120	358,649,373
II	142,439,490	236,992,000	379,431,134
III	156,637,770	233,385,600	390,023,009
IV	162,007,934	223,014,400	385,022,434
V	165,555,908	212,284,800	377,840,708
VI	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	.....	191,228,800	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

Mohawk, U. S. Smelting, Wolverine and American. In many cases these advances were on small lots.

On the Curb there have been sympathetic and proportionate advances. Curb brokers have had pretty hard sledding the past few months.

Assessments

Company	Delinq	Sale	Amt
Argenta, Ida	Sept. 10	Oct. 10	$0.001
Best & Belcher, Nev	Sept. 4	Sept. 25	0.05
Black Horse, Ida	Sept. 18	Oct. 19	0.01
Calumet, Ida	Aug. 15	Sept. 15	0.001
Challenge, Nev	Aug. 17	Sept. 7	0.05
Columbus Ext., Utah	Sept. 4	Sept. 27	0.05
Con. Virginia, Nev.	Sept. 9	Sept. 13	0.25
Copper King, Ida	Aug. 15	Sept. 16	0.01
Dalmatia, Ida	Aug. 3	Sept. 4	0.10
Douglas, Ltd., Ida	Aug. 25	Sept. 26	0.002
Hale & Norcross, Nev	Aug. 30	Sept. 20	0.05
Melcher, Ida	Aug. 26	Sept. 15	0.00½
New York-Bonanza, Utah	Sept. 8	.....	0.02
Overman, Nev	Sept. 12	Oct. 3	0.05
Pretoria, Ida	Aug. 15	Sept. 15	0.000½
Savage, Nev	Aug. 22	Sept. 12	0.10
Seven Troughs Mon., Utah	Aug. 12	Sept. 6	0.002½
Spider, Utah	Aug. 15	Sept. 15	0.002½
Tintic Standard, Utah	Sept. 9	Oct. 9	0.00
Torino, Ida	Aug. 15	Sept. 15	0.00
Utah Ideal, Utah	Sept. 6	Oct. 8	0.001½
Utah United Copper, Utah	June 24	.....	0.01½
Verde May, Ida	Sept. 6	Sept. 21	0.000½
Victoria, Mich	Aug. 21	.....	1.00
Wabash, Utah	Aug. 12	Sept. 2	0.10
Western Monitor, Utah	Sept. 11	Oct. 12	0.02½

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	53.308	24.343	24.797	24.583
June	52.538	53.462	53.043	24.166	24.651	24.486
July	51.043	54.150	52.630	23.519	25.034	24.286
August	51.125	52.912	52.171	23.588	24.428	24.082
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

	New York				London, Standard	
	Electrolytic		Lake			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	11.989	12.885	12.214	56.313	54.313
June	12.404	12.385	12.798	12.611	55.310	56.368
July	12.215	12.463	12.570	12.720	54.194	56.670
August	12.490	12.405	12.715	12.634	55.733	56.264
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1910.	1911.	Month	1910.	1911.
January	32.700	41.255	July	32.695	42.400
February	32.920	41.614	August	33.972	43.319
March	32.403	40.157	September	34.982	.....
April	32.976	42.185	October	36.190	.....
May	33.125	43.115	November	36.547	.....
June	32.769	44.606	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Mohth	New York		St. Louis		London	
	1910.	1911	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	4.373	4.164	4.223	12.550	12.984
June	4.343	4.435	4.207	4.292	12.688	13.260
July	4.404	4.499	4.291	4.397	12.531	13.530
August	4.400	4.500	4.290	4.406	12.513	14.026
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	5.348	5.041	5.198	22.100	24.375
June	5.128	5.520	4.978	5.370	22.094	24.612
July	5.152	5.695	5.002	5.545	22.406	25.006
August	5.279	5.953	5.129	5.803	22.800	26.801
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer		Basic		No. 2 Foundry	
	1910	1911	1910	1911	1910	1911
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	15.90	15.94	14.30	16.18	14.72
June	16.52	15.90	15.60	14.06	15.53	14.56
July	16.40	15.90	15.40	14.03	15.40	14.53
August	16.09	15.90	14.89	14.00	15.16	14.47
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 5

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01
C. K. & N.	.12
Doctor Jack Pot	.03½
Elkton Con.	.59½
El Paso	.51½
Findlay	.04
Gold Dollar	.15
Gold Sovereign	.02½
Isabella	.08½
Jack Pot	‡ .04½
Jennie Sample	.06
Lexington	‡ .01
Moon Anchor	.02
Old Gold	.03½
May McKinney	.41½
Pharmacist	‡ .01½
Portland	.95½
Vindicator	.73
Work	.01

SALT LAKE Sept. 5

Name of Comp.	Bid.
Beck Tunnel	.11½
Black Jack	.10
Carisa	.15
Cedar Talisman	.04½
Colorado Mining	.35½
Columbus Con.	.28
Daly Judge	‡4.12½
Grand Central	1.00
Iron Blossom	1.02½
Little Bell	.40
Lower Mammoth	.01½
Mason Valley	7.25
May Day	.11½
Nevada Hills	2.75
New York	‡ .04½
Prince Con	.64
Silver King Coal'n	1.70
Sioux Con.	.16
Uncle Sam	.46
Yankee	‡ .15

TORONTO Sept. 5

Name of Comp.	Bid	Name of Comp.	Bid
Conagas	6.50	Pearl Lake	.41
Hudson Bay	75.00	Porcu. Gold.	.45
Temiskaming	37½	Porcu. Tisdale	.04
Wettlaufer-Lor.	89½	Preston E. D.	.27
Apex	.16	West Dome	1.40
Central	.80	Standard	.03
Dobie	1.03	Foley O'Brien	.99
Dome Exten.	.70	Rea	3.25
Hollinger	10.20	Coronation	‡ 10½
Imperial	.14	Swastika	.40

SAN FRANCISCO Sept. 5

Name of Comp.	Clg.
COMSTOCK STOCKS	
Alta	.05
Belcher	.60
Best & Belcher	.18
Caledonia	.43
Challenge Con.	.16
Chollar	.14
Confidence	‡ .56
Con. Virginia	.65
Crown Point	.87
Gould & Curry	.10
Hale & Norcross	.20
Mexican	3.65
Occidental	.50
Ophir	1.67½
Overman	.32½
Potosi	.18
Savage	.22
Sierra Nevada	.43
Union Con.	1.65
Yellow Jacket	.43

Name of Comp.	Bid
MISC. NEV. & CAL.	
Belmont	6.55
Jim Butler	.23
MacNamara	.18
Midway	.24
Mont.-Tonopah	.81
North Star	.15
West End Con.	.58
Atlanta	.17
Booth	.08
C.O.D. Con.	.08
Comb. Frac.	.09
Jumbo Extension	.20
Oro	.05
Silver Pick	.06
St. Ives	.30
Tramps Con.	.02
Argonaut	2.25
Bunker Hill	7.00
Cent. Eureka	1.10
So. Eureka	‡7.00

N. Y. EXCH. Sept. 5

Name of Comp.	Clg.
Amalgamated	59¼
Am. Agri. Chem.	51
Am.Sm.&Ref.,com	70⅛
Am. Sm.& Ref., pf.	104½
Anaconda	34½
Batopilas Min.	1¾
BethlehemSteelpf	60⅞
Chino	19
Comstock Tunnel	‡ .20
Federal M.& S., pf.	50
Goldfield Con.	5⅜
Great Nor., ore ctf.	49
Homestake	82¼
Miami Copper	19¼
Nat'nalLead,com.	50⅛
National Lead, pf.	104
Nev. Consol	17⅜
Pittsburg Coal, pf.	82
Ray Con.	13⅜
RepublicI&S,com	25⅛
Republic I & S, pf.	90
SlossSheffi'd,com.	38
Sloss Sheffield, pf.	112
Tennessee Copper	33¼
Utah Copper	43½
U. S. Steel, com.	71¼
U. S. Steel, pf.	115¾
Va. Car. Chem.	53¾

N. Y. CURB Sept. 5

Name of Comp.	Clg.
Barnes King	‡ .15
Braden Copper	4⅝
B. C. Copper	3¾
Buffalo Mines	1¾
Butte & Vipond	.53
Butte Coalition	14⅞
Calumet & Mont.	‡ .20
Cobalt Central	.01
Con. Ariz. Sm.	⅝
Davis-Daly	⅛
Ely Con.	⅜
Florence	1¼
Giroux	4⅞
Greene Cananea	6
Greenwater	.05
Guanajuato	‡3¾
Guerrero	‡1⅛
Guggen. Exp.	185
Inspiration	6¾
Internat. S. & R.	‡124
Kerr Lake	4
La Rose	4⅛
McKinley-Dar-Sa.	1⅛
Min. Co. of A. new	5¼
Moneta Porc.	‡ 12
Mont. Shoshone	‡ .04
Nev. Utah M. & S.	1½
New Baltic	3¾
Nipissing Mines	8
Ohio Copper	1⅝
Pacific Sm. & M.	⅜
Precious Metals	‡1⅜
Ray Central	1⅜
Red Warrior	‡1⅛
South Utah M. & S.	1/16
Standard Oil	630
Stewart	.88
Tonopah	6⅛
Tonopah Ex.	.88
Tri-Bullion	⅜
Tularosa	⅜
Union Mines	25
Yukon Gold	3⅛

LONDON Sept. 6

Name of Com.	Clg.
Camp Bird	£1 8s 9d
Dolores	1 10 0
El Oro	1 3 3
Esperanza	1 15 0
Mexico Mines	6 14 6
Oroville	0 5 7½
Stratton'sInd.	0 1 9
Tomboy	0 18 0

BOSTON EXCH. Sept. 5

Name of Comp.	Clg.
Adventure	4½
Algomah	4⅜
Allouez	27
Am. Zinc	23½
Arcadian	‡2
Arizona Com.	1¾
Atlantic	‡6
Bonanza	.50
Boston & Corbin	4½
Butte & Balak.	3¾
Calumet & Ariz.	51¼
Calumet & Hecla	410
Centennial	9½
Con. Mercur	‡.65
Copper Range	54½
Daly-West	5
East Butte	11¼
Franklin	7⅜
Granby	29
Hancock	20
Hedley Gold	15¼
Helvetia	.75
Indiana	8
Isle Royale	14¼
Keweenaw	2⅜
Lake	24¾
La Salle	4
Mass	6¼
Michigan	2
Mohawk	41
New Arcadian	2⅛
North Butte	24½
North Lake	5⅝
Ojibway	5⅛
Old Dominion	37⅜
Osceola	88
Parrot	9⅛
Quincy	65
Shannon	8½
Shattuck-Ariz.	15½
Superior	25
Superior & Bost.	3¾
Tamarack	22
Trinity	3¼
Tuolumne	4⅛
U. S. Smelting	33
U. S. Smelt'g, pf.	46¼
Utah Apex	2¼
Utah Con.	12½
Victoria	2¾
Winona	‡5⅝
Wolverine	100
Wyandot	1

BOSTON CURB Sept. 5

Name of Comp.	Last
Ahmeek	155
Bingham Mines	1
Boston Ely	1
Boswyocolo	.10½
Cactus	.10
Calaveras	1
United Verde Ext.	.38
Chief Cons	.75
Corbin	1
Cortez	1¼
Crown Reserve	2⅛
First Nat. Cop.	1
Live Oak	18½
Majestic	.41
Mazatan	1
Nat'l Mine & Ex.	‡.10
Nevada-Douglas	2 3/16
Oneco	1½
Raven Copper	.29
Rhode Island Coal	1½
San Antonio	‡3
South Lake	4⅝
Trethewey	.65
United Zinc, pfd.	‡2
Vulture	5½
Yuma	‡.02

‡Last quotation.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES

ABRASIVES—		
Carbons,good drill quality,carat		$50.00@75.00
Carborundum, f.o.b. Niagara Falls, powd.	lb.	.08
Grains	"	.10@.17
Corundum	"	.07@.10
Crushed Steel, f.o.b. Pittsburg	"	.05¾@.06
Emery, in kegs; Turkish flour	"	.01¾@.02
Grains	"	.03½@.04
Naxos flour	"	.01¾@.02
Grains	"	.03½@.04
Chester flour	"	.01½@.02
Grains	"	.03½@.04
Peekskill flour, f.o.b. Easton, Pa	"	.01½@.01¾
Grains, in kegs	"	.02¾@.03
Garnet, per quality	sh. ton	25.00@35.00
Pumice Stone,Am.Powd.,100 lb.		1.60@2.00
Italian, powdered	per lb	.01¾@.01¾
Lump, per quality	"	.03@.30
Rottenstone, ground	"	.02@.04
Lump, per quality	"	.05@.20
Rouge, per quality	"	.05@.30
Steel Emery, f.o.b. Pittsburg	"	.07@.07½
ACIDS—		
Acetic 28%	lb.	.0169@.0184
Boric	"	.07
Hydrofluoric, 30%	"	.02¾@.03¼
" 48%	"	.06
" 52%	"	.06½
" 60%	"	.10
Hydrochloric acid, 20° per 100 lb.		1.25@1.50
Nitric acid, 36° to 40°	per lb.	.03¾@.04½
Sulphuric acid,50°,bulk per ton.		$12 up
60°, 100 lb. in carboys.		.85@1.12½
60°, bulk, ton		16.00@18.00
66°, 100 lb. in carboys.		1.00@1.25
66°, bulk, ton		18.00
Oxalic	per lb.	.07½@.072
ALCOHOL—Grain 95%	gal.	2.52@2.56
Denatured	"	.42
Refined wood, 95@97%	"	.52@.57
ALUM—Lump	100 lb.	$1.75
Ground	"	1.85
Chrome Alum	"	.04½@.05
ALUMINUM—Sulphate,com'l.	lb.	.90@1.50
AMMONIA—24 deg	"	.04½@.05½
" 26 deg.	"	.04¾@.05¾
AMMONIUM—		
Bromide	lb.	.32
Carbonate	"	.08@.08¾
Muriate gran	"	.05½@.06
Lump	"	.09½@.09¾
Sulphate, 100 lb.	"	3.10@3.15
Sulpho-cyanide com	"	.25
" " chem. pure	"	.35
ANTIMONY—needle,powder	lb.	.04½@.04¾
Oxide	"	.08¾@.10
ARSENIC—white	"	.01⅞@.02
Red, Outside brands	"	.05½@.06¼
Saxony	"	.06¼@.06¾
ASPHALTUM—		
Barbadoes	per ton	100.00@170.00
West Indies	"	30.00@60.00
Egyptian	lb.	.30@.40
Gilsonite,Utah ordinary	per ton	36.00@50.00
Trinidad	"	25.00@30.00
California	per ton	22.50@30.00
BARIUM—		
Carb. Lump, 80@90%	lg. ton	26.00@35.00
Precipitated, 96@98%	"	31.00@33.00
Powdered, natural	lb.	.02@.02¼
Chloride com'l	ton	32.50@37.50
Nitrate powdered, in casks	lb.	.05½@.06½
Blanc Fixe, dry, bbl.	per lb.	.02¾@.04
BARYTES—		
Am. Ground	sh. ton	12.00@13.00
Floated	"	16.00@17.00
Foreign floated	"	18.00@22.50
BLEACHING POWDER—35% 100 lb		1.17½@1.40
BLUE VITRIOL—(copper sulphate), carload, per 100 lb.		4.50@4.75
BONE ASH	lb.	.02¾@.04
BORAX, sacks	"	.03¼@.04
CALCIUM—Acetate,gray,100 lb.		1.89½@2.00
Carbide, ton lots f.o.b. Niagara Falls, N. Y.	sh. ton	65.00
Chloride, f.o.b. N. Y.	"	9.00@12.00
CEMENT—Slag cement	bbl.	0.75@1.25
Portland, Am. 400 lb	"	1.20@1.30
Foreign	"	2.25@2.90
"Rosendale," 300 lb.	"	.85
(in sacks)	"	.65
CHROME ORE—		
New Caledonia 50% ex. ship N. Y.	per lg. ton	14.00@16.00
Bricks, f.o.b. Pittsburg, per M.		175.00
CLAY, CHINA—Am. common ex-dock, N. Y.	ton	8.00@9.00
Foreign	"	11.50@18.00
COBALT—Oxide	lb.	.80@.85
COPPERAS—Bulk	100 lb.	$0.55
In bbls	"	.65@.85
In bags	"	.60@.80
CRYOLITE (carload)	lb.	.06¼@.07
FELDSPAR—Ground	sh. ton	8.00@12.00
FIRE BRICK—		
American	per M.	30.00@40.00
Imported	"	30.00@45.00
St. Louis	"	16.00
Extra	"	20.00@23.00
Specl l extra	"	30.00@35.00
FIRE CLAY—f.o.b. St. Louis.		
St. Louis, extra quality	per ton	5.00
" ordinary	"	2.50
FLUORSPAR—		
Domestic f.o.b. Pittsburg:		
Lump	ton	8.00@10.00
Ground	"	12.00@14.00
Foreign crude ex. dock	"	8.50
FULLER'S EARTH—Lump,100lb.		.80@.85
Powdered	"	.80@.85
GRAPHITE—Ceylon.		
Flying dust, finest to best	lb.	.01@.02
Dust	"	.02@.04
Chip	"	.03@.06
Lump	"	.04@.09
Large lump		.04@.08
GYPSUM—		
Fertilizer	sh. ton	5.00
Ground	"	4.00@7.00
INFUSORIAL EARTH—		
Ground Am. Best	lb	.01¾@.02½
German	"	.02¼@.02⅝
LEAD—		
Acetate (sugar of) brown	lb.	.07¾@.09½
Nitrate, com'l	"	.07⅛@.08¼
MAGNESITE—Greece.		
Crude (95%)	lg. ton	7.50@8.50
Calcined, powdered	sh. ton	26.00@35.00
Brick, domes, per qual. f.o.b. Pittsburg	M.	160@200
MAGNESIUM—		
Chloride, com'l	100 lb.	.90@1.25
Sulphate (Epsom salt)	100 lb.	1.00@1.10
MANGANESE—		
Foreign, crude, powdered:		
70@75% binoxide	lb.	.006@.01
75@85% binoxide	"	.011@.015
85@90% binoxide	"	.01½@.04
90@95% binoxide	"	.06½@.08½
Ore, 80%-85%	sh. ton	12.00@25.00
MARBLE—Flour	sh. ton	9 00@9.50
MINERAL WOOL—		
Slag, ordinary	sh. ton	19.00
Selected	"	25.00
Rock, ordinary	"	32.00
MONAZITE SAND—		
Guar. 97%, with 5% Thorium oxide, normal	lb.	.08 and up
NICKEL—		
Oxide, crude, lb. (77%) for fine metal contained		.40@.45
Sulphate, single	lb.	.10¼@.11
Sulphate, double	"	.05⅛@.08
NITRATE OF SODA—		
100 lb. 95% (spot)		2.17½
95% (future, 1911)		2.20
96% is 2½@7½c. higher per 100 lb.		
OZOKERITE—best	lb.	.12@.16
PAINTS AND COLORS—		
Litharge, Am. powdered	lb.	.07½@.07¾
English glassmakers'	"	.08¼@.09½
Lithophone	"	.03¾@.04
Metallic, brown	sh. ton	18.00@20.00
Red	"	25.00@30.00
Ocher, Am. common	"	12.00@15.00
Best	"	15.00@20.00
Dutch, washed	lb.	.02¾@.03½
French, washed	"	.01½@.02
Paris green, pure, bulk	"	.13@.18
Red lead, American	"	.06½@.07
Foreign	"	.08½@.09
Turpentine, spirits bbl., per gal.		.55@.57
White lead, Am., dry	lb.	.05½@.06
American, in oil	"	.07½@.07½
Foreign, in oil	"	.09¾@.10
Zinc white, Am. extra dry	"	.05¾@.06½
French proc's, red seal, dry	"	.08¾
French process, green seal, dry	"	.10¾
PHOSPHATES—Acid		60@62c. per unit
*Fla., hard rock 77%		5.75@6.25
land pebble 68%		3.70@3.80
†Tenn., 78@80%		5.00@5.50
75%		4.75@5.00
68@72%		4.25@4.50
‡So. Car. land rock 60%		3.50@3.75

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—		
Bicarbonate crystal	lb.	$.07½@.08
Powdered or granulated	"	.08@.08½
Bichromate	"	.07¾@.07¾
Bromide	"	.20
Carbonate (80@85%)	"	.03½@.04
Caustic, ordinary	"	.03¾@.05¾
Elect. (90% KOH)	"	.05¼@.05½
Chloride (muriate), 100 lb		1.90
Chlorate, powdered	"	.08½@.09½
Crystals	"	.08¼@.09¼
Cyanide (98@99%)		
Carloads (30,000 lb.)	"	18c.
5-ton lots		18½c.
Less than 5 tons		.19
Kainite, long ton, bulk, 7.50; bags,		8.50
Permanganate	lb.	.09½@.10½
Prussiate, yellow	"	.13@.13¾
Red	"	.26@.30
Sulphate (basis 90%)	100 lb.	2.18@2.21
PYRITE—		
Domestic, non-arsenical, furnace size,f.o.b. R. R.	per unit	.12@.12½
Domestic, non-arsenical, fines, per unit, f.o.b. mines		.09½@.11½
Imported, non-arsenical, furnace size, ex-ship, per unit		.13@.13¼
Imported, arsenical, furnace size, ex-ship, per unit		.12½@.12¾
Imported fines,arsenical,ex-ship		.09½@.10
Imported fines, non-arsenical, ex-ship, per unit		.10½@.11

Pyrite prices are per unit of sulphur. A deduction of 25c. per ton is made when ore is delivered in large lumps.

SALT—N. Y. com. fine 280 lb.	bbl.	.72@1.13
N. Y. agricultural	sh. ton	3.80@4.50
SALTPETER—Crude	100 lb.	4.00@4.50
Refined, crystals		5.00@5.75
SILICA—		
Ground quartz, ord'ry.	lg. ton	7.00@15.00
Silex, ground	"	7.00@15.00
Silex, floated	"	30.00@40.00
Lump quartz	"	5.00@5.50
Glass sand	"	2.75
SILVER—Nitrate, crystals	oz.	.33½@.36¾
SODIUM—Acetate	lb.	.04½@.05
"Alkali," per 100 lb., 58|48		.90@.95
Bicarb. soda, per 100 lb		1.00@1.30
Soda, caustic, per 100 lb., 78|60		1.70@1.80
Soda, caustic, powdered		.02½@.03
Salt cake, per 100 lb., bulk		.50@.62½
Salt Cake, bbl.		.67½@.80
Soda, monohydrate, per lb.		1.30@1.75
Bichromate	lb.	.05½@.05¾
Bromide	"	.20
Chlorate, com'l	"	.08¼@.09½
Cyanide, 120-130% KCN, per 100%		
Carloads (30,000 lb.)	lb.	18c.
5-ton lots		18½c.
Less than 5 tons	"	.20
Hyposulphite, Am.	"	1.30@1.50
Phosphate	100 lb.	2.10@2.40
Prussiate	"	.08@.08¾
Sal soda, f.o.b. N. Y.	"	.60@.75
Foreign, f.o.b. N. Y.	"	.80@1.00
Silicate, com'l	"	.65@1.00
Sulphate, com'l (Glauber's salt)	100 lb.	.60@.80
Sulphate, com'l, calcined		.65@.85
STRONTIUM—Nitrate	lb.	.07@.08
SULPHUR—Louisiana (prime) to New York	lg. ton	22.00 up
To Boston, Philadelphia or Baltimore	"	22.50 up
Roll	100 lb.	1.85@2.15
Flour	100 lb.	2.00@2.40
Flowers, sublimed	100 lb.	2.20@2.60
Powdered commercial, bags.		1.50
Sicilian, extra qual., unmixed seconds, crude brimstone to New York	lg. ton	$22.50
TERRA ALBA—Fr.&Eng.	100 lb.	.75@.90
TALC—Domestic	sh. ton	12.00@25.00
French	"	15.00@25.00
Austrian	"	35.00
Italian, best	"	33.00
TIN—Bi-chloride, 50°	lb.	.12½
Crystals	"	.27
Oxide, lb	"	.45
URANIUM—Oxide	"	2.20@4.25
ZINC—Chloride sol., com. 20	lb.	02½
Chloride, granular	"	.04@.04½
Dust	"	.06¾@.07
Sulphate	"	.02@.02½

NOTE.—These quotations are for ordinary wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. In the cases of some of the important minerals, such as phosphate rock, pyrites and sulphur, in which there are well established markets, the quotations are substantially representative. But in the cases of some of the minor mineral products, the quotations represent what dealers ask of consumers and not what producers can realize in selling their output or private contract.